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PETROLEUM.

ON THE ACTION OF OIL WELLS.

BY PROF. E. W. EVANS, MARIETTA COLLEGE.

The phenomena exhibited by oil-wells suggest various problems, the discussion of which may be of scientific as well as practical interest. The facts on which the following remarks are based have been collected chiefly from the history of different wells in the coal regions of Southern Ohio and West Virginia.

It seems certain that the principal supplies of petroleum are not diffused between the planes of stratification, but are collected in cavities more or less sunken in the strata, whence it is less liable to be carried away by running water. Prof. E. B. Andrews has shown, in an article published in this Journal,* July, 1861, that it is common to find large quantities in places where there are marks of disturbance and displacement of the rocks. The cavities have probably been caused sometimes by uplifts and sometimes by erosion and the devolving action of water; but whatever may be their origin, they are not usually of great horizontal extent. It is seldom that two neighboring wells strike oil at the same depth, whether the strata be horizontal or dipping. It is one chance out of many to strike oil at all, even in neighborhoods where it exists in abundance. The drill, as it enters the cavity, sinks variously from four or five inches to as many feet, sometimes sticking fast, as if between the oblique sides of a narrow-fissure. But there are facts connected with the history of oil-wells, particularly their intermittent action and their interference with one another, which serve to show the existence, in many cases, of systems of these cavities connected together by channels of communication more or less free, running sometimes along the strata and sometimes across them. The productiveness of a well depends on its entering either one of the main reservoirs or some of its important connections.

Let us begin with the most simple case, that of a single or isolated oil-cavity. Every collection of oil is accompanied with varying quantities of gas and water, the gas occupying of course the top of the cavity and the water the bottom, according to the order of their specific gravities. First suppose that a well is bored so as to enter the gas. Being in a high state of tension the gas escapes, sometimes with explosive violence, carrying out with it whatever water there may be collected in the boring. If water enters the cavity freely, as is usually the case, the oil, floating on its surface, is soon driven upward to the mouth (i. e., lower end) of the tube; it may then be pumped out till the line of division between it and the water rises to the mouth of the tube; after which, mixed oil and water will be drawn. But it often happens that the water rises faster than it can be thus exhausted, and the oil, driven into the top of the cavity, is lost, until the water is reduced by machinery of greater working power. But as it cannot be reduced below the mouth of the tube, unmixed oil cannot again be obtained from the well. In all wells from which the gas has escaped, there is ultimately a saving of work if the oil is pumped out as rapidly as possible before the intrusion of water.

*The American Journal of Science and Arts.

Secondly, suppose that the boring is done and enters the oil. In this case, the oil rises in the tube to a height depending on the tension of the gas above it; a mode of action which is illustrated by the familiar apparatus called the fountain with condensed air. Sometimes it is thrown into the air a distance of 30 or 40 feet, and large quantities wasted. If the oil continues to be ejected till its surface in the cavity descends to the mouth of the tube, the fact first becomes known by a gurgling and spurting action, and the gas, or the greater portion of it, escapes, after which the pump becomes necessary, and the same series of actions take place as in the first case. But if the gas reaches its equilibrium with the hydrostatic pressure before the oil is reduced so low, we may then pump out the oil till the water rises to the mouth of the tube, after which we shall obtain mixed oil and water as before, till the whole supply of oil is exhausted, provided the pump is of sufficient working power to prevent interruptions by the too rapid rise of the water.

Next suppose that the boring is done, and enters the water. If the gas has sufficient tension, water is raised until its surface in the cavity descends to the mouth of the tube, then mixed oil and water is obtained, then pure oil, after which the same circumstances exists as in the second case. It must not be inferred, however, that when the water is not thrown to the surface there is no oil. It may happen that the pressure of the gas will raise a column of water only part of the way up the boring, and yet the well be found productive. Hence no considerable quantity of water should be passed without ascertaining by reducing it with the pump whether there is oil confined above it in some side chamber. The Shattuck well on the Little Kanawha had to be drained of water with a steam pump for two weeks before oil was obtained; but after that it yielded abundantly.

Some varieties of action are to be accounted for on the supposition that there are, in the same cavity, different collections of gas separated by a partition descending from the top. A well enters the gas chamber; the gas escapes with violence, and yet the oil immediately begins to flow in a continuous stream over the top of the boring, and is perhaps projected in the form of a jet to a great height, by the pressure of the gas in another chamber of the same cavity.

It is evident that if a second well be sunk so as to enter the gas in the chamber the oil will immediately sink to the level of that, and be lost to the first well; a mode of interference which sometimes occurs, when two wells are quite near together.

Thus far I have considered only isolated oil-cavities, or those which, when exhausted, are not replenished to any considerable extent from other sources. In general these run their course in a short time, and yet they sometimes yield very large quantities of oil.

There is a second class of wells, in general more productive, which exhibit the same phenomena at first, but as often as they are exhausted are replenished again, and repeat a certain series of actions indefinitely, and with remarkable regularity of time. This is to be explained by supposing that they are connected with other reservoirs by slight channels of communication, whose capacity for replenishing is less than that of the tube for exhausted. Suppose that a well enters the oil. After this well has thrown out oil, and perhaps afterward water, by force of the condensed gas, it comes to a stop. Then owing to the diminished tension of the gas in the enlarged space, the gas and oil force slight passages, until the gas in this cavity again becomes sufficiently compressed to raise oil and water successively; after which the well comes to another stop until it is replenished with oil and gas as before; and the same process is repeated an indefinite number of times. The Newton well, on a branch of the Little Muskingum, a few miles from Marietta, repeats this process (with some escape of gas) at regular intervals of about half an hour, expelling about a barrel of oil each time. A note-worthy fact connected with this well is that when it stops it is necessary to pump out a little water in order to start it again; then the oil issues spontaneously. This is to be explained as follows. The pressure of the gas is not quite sufficient to raise the water to the surface; but the position of the mouth of the tube is such that a few strokes of the pump suffice to reduce the surface of the water in the cavity below that point. Now a column of oil will be raised by a given pressure so much higher than a column of water as its specific gravity is less. In this case it is raised not far from a fourth higher (the specific gravity of the oil being ·816); and the difference is sufficient to make it flow over the top of the tube. Examples of this kind are common.

The well is represented as having but a few connections, but it is probable that these lines of slow communication are usually numerous: the gas and oil like the water, forcing their way in through a multitude of pores and slight crevices, until a state of equilibrium is gradually reached or approximated to, as mercury forces its way in through the pores of wood into the exhausted receiver of an air-pump. Sometimes it happens that the cavity is filled with sediment of clay and sand by these little streams, and the well becomes inactive.

The class of wells here described may be distinguished from others as intermittent wells. The finding of one of these may be regarded as a certain sign that there are numbers of oil cavities near together in the same locality. Especially if it yields copiously for months in succession, as often happens, without any material diminution in quantity, or increase of the intervals between the successive yields, the rocks in its neighborhood may be presumed to contain rich supplies of oil that may be directly reached.

On Oil Creek in Pennsylvania the greatest quantities of oil are found in the same horizontal stratum of sandstone. It would seem that this rock is very porous, and perforated like a honey comb with numerous cells and fissures containing petroleum. The history of many of the wells is as follows. When oil is entered, the gas begins to raise it up over the top of the boring, increasing gradually in force until it projects it into the air, often to a height of 40 or 50 feet, then alternately diminishing and increasing in force at regular intervals, but without any cessation in the flow for a long time. These variations in the force of the gas (the "breathing of the earth," as they are called,) are to be explained on the same principal as before, by supposing that as the tension of the gas is relaxed by the removal of oil, the gas and oil from other cavities around rush in through the pores and slight fissures till a certain maximum tension is reached, and the in

flux ceases; then by the expansion of the gas already in the chamber the oil continues to come up, but with a diminishing flow, until a relative vacuum is again created; after which the influx is renewed and gradually increases as at the beginning. These regular alternations vary in different wells from two or three times a day to as many times an hour; the intervals, however, gradually increasing in length as the supply of oil is diminished; unless, as sometimes happens, new communications are forced, and the well, deriving new supplies, starts off again with a new period. It often happens that the same well has two periods;—one of variation in the flow, and another of cessation, consequent on the escape of gas.

A more uniform flow may be secured by making the orifice at the mouth of the tube smaller. This is often desirable in order to prevent the escape of gas by the exhaustion of the oil in the cavity down to the bottom of the boring. Sometimes such a quantity will thus rush out, before the oil raised up by the water, closes the passage again, as not only to render the pump necessary after that to raise oil, but also to diminish materially the influx of oil from other cavities by reducing the pressure of the gas in them. Another expedient sometimes resorted to, when the spontaneous flow of oil becomes slight, is to stop up the boring till another "head of gas," as it is called, accumulates. But the stoppage should not be continued long; for instances are known where the gas has in consequence forced a way from its new channels in other directions, and found vent in other wells.

It is not an uncommon thing for intermittent wells to throw out at first 300 or 400 barrels a day, or to yield in all as much as 20,000 barrels. They sometimes run two or three years before exhaustion. The productiveness of the Lewellyn well on the Little Kanawha greatly exceeded these figures.

It is evident that if a second well were sunk so as to enter the cavity, the well would lose one portion of its supply of gas and oil, and be to this extent interfered with. Sometimes a very productive well thus cuts off the main supplies of a number of less considerable ones in its neighborhood, or, if the first sunk, it is itself tapped by them.

But some of the most marked cases of interference that are known, show the existence of a third class of oil cavities, connected with one another by perfectly free channels of communication, so that when the equiliburium between them is disturbed, it is immediately restored. A well enters the cavity finding oil. Another well is bored so as to enter an open channel between two cavities. This will drain oil from the first well; but if, its mouth is lower than that, it can be made a valuable auxiliary to it when the rising water drives the oil into the upper part of the cavity; for it can be used to reduce the water, and thus to keep the oil within reach of the first well.

Again a well is bored, and passes through a strong current of water. It finally descends to a fissure, and interferes with both the other wells by letting in such a head of water as to drive the oil in both cavities above the mouths of the tubes. Pumping the water out of all these simultaneously might bring the oil down again within reach of that tube at least which enters at the highest point. A better expedient is to stop up tightly the space on the outside of the tube in the well, just below the stream of water. This is often effected by lowering a leather bag filled with dry seeds to the required depth. As water penetrates it, the seeds swell and close the passage,

Examples differing in details might be multiplied indefinitely. I have aimed only to point out in a general manner the different modes of action, and the hypotheses on which they are to be explained.

In the foregoing illustrations the quantity of gas has been supposed considerable. In many cases however it is so slight that the pump has to be used throughout. Yet wells of thiskind often partake of the intermittent character to some extent. As it is not usual to work them at night, they begin each day with a new accumulation, which gives them a certain regularity of daily action often considered mysterious. There is a well a few miles from Marietta which yields oil only for a short time in the morning; when neglected till that time is passed, it is unproductive for the day. This is owing to the proximity of another well, which drains it of its water in the daytime, but by resting at night allows it to be replenished. Wells of small supply often require a certain interval of rest to be replenished, but never exceed a certain amount, however that interval may me extended—the column of oil having reached its maximum height by pneumatic or hydrostatic pressure.

Oil-wells commonly vary in depth from 100 to 800 feet. The deepest are as apt to raise oil to the surface as the shallowest. This indicates a greater compression of the gas at the greater depth, owing doubtless to its connection with higher columns of water. The activity of some wells is increased by rains; others, with less gas, are rendered unproductive till the water can be reduced. It must not be assumed however that their connection with subterranean currents is immediate and unobstructed. I know of no instance where there is reason to suppose that the oil is raised to the surface by the direct pressure of a stream of water whose head is higher than the issue, as the jets of Artesian wells are said to be produced. In spouting wells, the presence of gas as the immediate agent becomes known, not only from their variable action, but also from the actual escape of gas, and consequent cessation of flow whenever the oil is reduced to a certain level. If collections of oil had direct and free connection with strong currents of water, the mechanical agency of these currents would bear them rapidly away.

As it is, minute quantities come to the surface with the springs, showing a very slow process of drainage. As an index of the location of oil-cavities this sign is not reliable; for that which issues may have been carried by the streamlets many miles from its source. Gas springs are less deceptive signs; for the gas being more buoyant than the oil and not liable to be carried along by descending currents, it is not likely to wander so far before it issues. But the "show of oil" increases in value as a sign with the depth at which it is found. Especially is the finding of large quantities of imprisoned gas, though no oil may be present, regarded as a good indication that there is oil near.

Marietta, May 4th, 1864.

Wallachium Petroleum.—The Polytechnisches Journal gives information of a new outlet of earth oil in the rich and remote province or principality of Wallachia. The German Journal, after warning commerce to remember that the oil wells of Pennsylvania and Canada have a way of suddenly going out, "thanks, in a great measure, to the indiscriminate way in which rich mother Earth is so bored and tapped, as to make it easy for the gas to escape, by which the Petroleum would else be forced up; or else for water to get in and flood or choke up the springs," goes on as follows:

But there are other Petroleums fast coming into the market Not to speak of the Burmese Rangoon oil, which has long come to England as ballast, and is used in many German refineries, in January of the present year, the first cargo of Wallachian oil reached London. It was of 280 tuns, and the company which brought it, have closed a contract to deliver 20,000 tuns in all the year 1864. A second "Wallachian Petroleum Company" has since been formed. Two specimens of the Wallachian Oil compare as follows with an average quality of Pennsylvania:

Qualities.	Pennsylvania Oil.	1. Wallach.	2. Wallach
Color.....	Greenish Brown	Brown.	Dark Brown.
Fluidity (water—1)	0·73	0·68	0·09
Specific gravity	0·813	0·840	0·894
Smell.....	Moderately strong.	Strong and unpleasant.	Not very strong.

The general result of Dr. Otto Buchner's analysis is, that the Wallachian product is a valuable contribution to commerce and industry, although he does not think it has demonstrated its fitness to compete with the Petroleum of Pennsylvania. Dr. Buchner, however, has not found his experiments confirm the assertion of American analysts, that the lighter Pennsylvania oils of a specific gravity of 0·80, giving 90 per cent. of burning oil. His highest result has been 70 per cent., of which from 15 to 20 per cent. of benzine.

THE PENNSYLNANIA WELL OIL COMPANYIES.

The following well timed and truthful remarks we extract from the *U. S. Railroad and Mining Register:*

There are now afloat in the Philadelphia stock market at least seven millions of capital shares issued by about one hundred and fifteen oil companies. A list of 104 oil companies now on our table, shows a total of 6,252,250 capital shares, equal to 60,121 shares for each company.

The total number of capital shares issued by all the railroad companies in Pennsylvania, that use locomotive power, does not exceed two and a half millions, being but little more than one third the number of capital shares issued by the oil companies organized in Philadelphia alone. The 3,300 miles of locomotive railroad in use in Pennsylvania cost $200,000,000, and yet this vast property is represented by less than one-fourth the number of shares issued by the companies owning the oil wells in Pennsylvania; for it must be taken into consideration that there are oil companies organized elsewhere than in this city, a single oil company organized in New York, or put on that market, having its capital divided into six hundred thousand shares.

Speculators interested in the original allotment of shares, and brokers whose commissions are imposed on the number of shares bought and sold, are the parties specially benefitted by the existing plan of oil company organization, because it is impossible to keep the credit of even a producing company on a stable basis, where there are 200,000 or 100,000 or 50,000 shares on the market. Shares subscribed for on speculation float about in the market like corks on the water, bobbing up and down with every ripple of the surface. And not till after the companies that own producing wells shall have consolidated their shares to a minimum number, say from 200,000 to 20,000, will they be held more generally for investment and less for speculation. The State is full of examples where companies that originally issued 200,000 shares afterwards cut the number down to 20,000 shares. The Lehigh Zinc Company is a notable case of this sort.

The oil region of Pennsylvania is a producing region dotted with wells that yield copiously in gallons and earn largely in dollars. The interest of the oil region, moreover, is in the well-product of oil and in the market price of oil, more than in shad-roes of capital shares and fitful changes in stock speculations. The oil region and its investing friends, too, are interested in having bogus companies that were organized only to sell shares, weeded out of the market. Hence the sooner the oil companies begin to reorganize on a basis of say 20,000 shares, the sooner will permanent investers buy and hold oil shares to enjoy dividends paid out of the product and profit of the oil wells.

Two years ago, oil which is now $12 per barrel at Titusville was at Titusville $1 per barrel. And when in the revulsions of the market, for in all markets there are fluctuations, oil lapses into low figures, oil stocks will fall to zero in the market; because speculators will unload and sell out, leaving their places to be filled with a better class of holders who, after buying at low rates, will diminish the number and increase the par of oil shares. And then, with the shad-roe companies reorganized, and the weekly shipments of oil from the wells regularly published, there will be attached more confidence to the oil trade, and the producing companies will raise in credit according to a scale based on well product and commercial value. The product of the oil region in 1863 was, we believe, 2,000,000 barrels. At the low prices that ruled two years ago this product, which fluctuates less in quantity than in price, netted a considerable sum. At the prices of 1864 the product of the region will realize an enormous income. But parties who buy oil shares these days must bear in mind that now there are an hundred millions of dollars of oil shares issued in the stock markets, to represent the same property which, two years ago, was

held by individuals and partnerships whose modest aspirations did not rise to the contemplation of millions, neither of shares nor dollars.

Our faith is in the oil region and in the product of its wells, but the present stock basis of the oil companies we believe is deceptive and wrong, and in need of readjustment.

About the close of July, petroleum stock, after maintaining quietude at the Philadelphia Stock Board, "got on a rampage," and during August, the sales were truly enormous. We give below a list of the companies in whose shares operations were most active, with the cash selling prices at the close of each month respectively, from the American Exchange and Review.

	July 27.	August 27.
Big Tank, . . .	$1	$ 2¼
Briggs, ...		4 3-4
Bruner, ...		2
Bull Creek, . . .		4 1-2
Curtin, ...		3 1-4
Cherry Run, . .	5 1-4	7
Corn Planter, . .	3	5
Continental, . .	2	2 1-2
Dalzell, ...	7 1-4	12 1-2
Densmore, . . .	8 1-4	15 1-4
Egbert, ...	2 1-2	3 1 2
Excelsior, . . .	1	1 1-2
Globe	2	2 1-2
Hibberd, . . .		2 7 8
Hogue Island, . .	1	2
Mineral Oil, . .	2 1-2	2 3-4
McClintock, . .	5 3 4	7 3 4
McElheny, . . .	6 1 2	9 7-8
Noble & Delameter.	12	17 1-2
Oil Creek, . . .	6	6 7-8
Organic, ...	1	1 1-2
Phil & Oil Creek,	1	2 1-4
Rock Oil, . . .	3 1-2	5 1-4
Story Farm, . .	2 1-2	4 3-4
Union Petroleum,	2 1-4	3 3-4
Venango, . .	3-4	1 1-4

The Curtin's shares attracted more attention than others during the month, Big Tank seems to be the rage now. We would not be surprised to see a strong movement in Continental ere long

Paraffine.—Paraffine possesses certain properties which render it useful in the laboratory. It may be advantageously substituted for oil in baths, as it endures a high temperature without evaporating or emitting any unpleasant odor. Filtering paper, after being soaked in it, may be kept several weeks in concentrated sulphuric acid without undergoing the slightest alteration. From this property of paraffine it may be advantageously applied as a coating to labels on bottles containing strong acids; fluoric acid, even, does not act upon it, except it be heated. Paraffine appears also to be useful in preserving fruits. Apples, pears, &c., coated with it, retain all their freshness during several months.

Oil in Clarion County.—The Clarion, (Pa.) *Banner* says: We learn that the contractors for boring the wells at Blyson's Run have erected their derricks and built their shanties, and only await the arrival of the engines to commence more active operations. In view of the oil prospects on the Clarion, it is said that property in Strattanville is rapidly on the rise. The farm at the mouth of Deer Creek, near Hahn's Ferry, has been bought by a company for oil purposes A well bored on this property many years ago for salt, was abandoned on account of the prevalence of oil. Some oil from it was taken to Pittsburg and sold for medicinal purposes. It is currently reported that the Sligo Iron Company, south of Clarion, have struck oil at the depth of nine hundred and seventy feet, and have a flowing well.

A new metal called langite, a basic sulphate of copper, has been discovered and exhibited by Prof. Maskelyne.

MINING.

ELECTRICITY IN MINING OPERATIONS.

The efforts of Messrs. Dumas and Benoit to produce, by the application of the electricity obtained from a voltaic pile in combination with a Ruhmkoff's coil and Gissler tubes, a safety-lamp of practical utility for mining purposes has again directed attention to the advantages derivable from the employment of electricity in mining operations. Although the proposition to apply electricity for lighting mines is one not very likely to prove of any advantage, there can be no doubt that for blasting it may become one of the most important aids to mining that could be conceived, as it is calculated to combine absolute safety with great economy Messrs. Dumas & Benoit proposes to used their improved lamp, not in ordinary cases, but in searching workings, "the air in which, although capable of being respired, will not support combustion," and it will be apparent that it is in such cases that an electric light could be employed; but the light from one of these lamps is so extremely small (not one-fifteenth of that given by a wax candle), whilst their price is so high that they would seldom be introduced, even if it did not happen that where the air is so bad as to be incapable of supporting combustion, a lamp giving only this glimmering light would be altogether useless. Writing upon the advantages of the electric lamp, Mr. Parran, an engineer of considerable experience, states that he considers the lamp applicable in those exceptional cases where the ordinary lamps become perfectly useless, and instances, as an example, the case of its being required to push on indispensable workings incapable of thorough ventilation, but in which the air, although fit to be respired, is incapable to support combustion. Where are these workings to be found?

Alluding to an accident at the Lalle Mine, Mr. Parras states that one of the principal difficulties met with in endeavors to rescue some workmen was to sink the incline pits through the coal; he says that, notwithstanding the use of ventilators, the lamps continually went out, so that it required a chain of men to be continually occupied in re-lighting them. If men had not been procured in sufficient numbers to accomplish this the rescue of the men might have been gravely delayed. The employment of an electric lamp would have obviated all this difficulty. When the opening was at last made, it required more than two hours to rescue the last of the three men, who had been shut up for many days, in consequence of its being necessary to ventilate the heading by air pipes before the lamps would burn in it. With the electric lamp he considers the men would have been saved in ten minutes It is scarcely reasonable to suppose that Mr. Parran seriously makes such statements as these, since for a practical man to put in additional workmen because the air was foul seems positively absurd, and it is unlikely that the men could work for days in an atmosphere where lamps would not burn. The entire statement must be a fabrication, unless it is to be supposed that a single emergency was sufficient to sacrifice all Mr. Parran's reputation, by proving that he did not know how to keep a single heading properly ventilated.

To turn to the consideration of blasting by electricity, we believe it is much more practicable, not however with the arrangement proposed by Messrs. Dumas and Benoit, but a far more simple and economic one, of which mention has already been made in the *London Mining Journal*—we allude to that introduced by Prof. Wheatstone and Mr. Abel, of Woolwich Dock-yard. The cost of the material and apparatus for electric blasting by Messrs. Dumas and Benoit's apparatus is 36*l.*; whilst the Wheatstone and Abel apparatus cost less than one-fourth. Indeed Mr. Wm. Ladd, the philosophical instrument maker of Beak-street, Regent-street, who has (by permission of the Secretary of State) been appointed sole manufacturer of the patent fuses, is at present selling an elegant magneto-electric machine of great portability, and of very ample power for firing the fuses, for 7*l.* 7*s.* Considering the advantage which must result from the introduction of electric blasting, Mr. Ladd is now making a less highly finished, though equally powerful, machine, which he will be enabled to sell for 4*l.* 4*s.*, and as the fuses are now supplied at 4*s* 6*d.* per dozen, blasting will be conducted as cheaply by electricity, with absolute safety, as with the dangerous powder fuses at present in use That the new fuse possesses important advantages over those hitherto in use cannot be doubted, and it will, probably, be found ere long that electric fuses are an effectual preventive of accidents in collieries from the ignition of the coal through carelessness, and in metalliferous mines from the mis-firing, or supposed misfiring, now so frequent. It will be remembered that after the most careful experiments magneto-electricity was found to give the best result, and that the fuse itself is a modification of the Statham fuse, the principal difference being the substitution of a sub-phosphide of copper for the sulphide used by Statham. The results obtained with the improved composition were as near as may be perfect, and hence the satisfactory opinions that have been given in every instance in which they have been used. The great advantage of the electric fuse is that it cannot be accidentally fired in tamping, and that the ignition is effected by an electric spark only, the lighting of the fuse by flame when ready for firing being positively impossible, the only means of communication between the ignition portion of the fuse and the exterior of the bore-hole being a thin copper wire. The machine by which the fuse is lighted is a small magneto-electric machine (no battery being required), as portable as a safety-lamp; it is no more likely to get out of order than a wheelbarrow and can be as easily repaired. *London Mining Journal.*

LIGNITE.

At the meeting of the Portugal Iron and Coal Company, says the London Mining Journal, a letter was read from one of the Lisbon directors, containing an account of a visit he had just been paying to the company's mine of lignite, which is just now being opened out, and which posesses interest from the circumstance of so little being known amongst us about this class of fuel. This gentleman writes—"I found the cover, about 12 feet high, of sand and clay removed to some extent from this abundant deposit of fossil wood. The men were cutting away about 3½ ft. deep of this lignite, for the purpose of converting it into charcoal. This 3½ ft. deep of the bed is pine wood, crushed into fragments, but still retaining all the appearance of felled and chopped wood. The charcoal made from this part of bed is used by our smiths. They find it to give a very strong heat, and serve the purposes of the smithy perfectly well. The overseer had the lower and more impure part of the lignite bed also charred; but though it burned well, it contained to much sulphur to serve for the smithy; but if ground up and mixed with the smalls of the charcoal of the upper part of the bed, and some tar or mineral pitch, which we know to exist in the vally under the lignite, it would make, when formed into bricks, excellent patent fuel, for which a large consumption would be procured in Lisbon and Oporto, and probably in the locomotives. Of its value as a fuel for smelting iron I cannot speak, but in some parts of Germany, where fuel is scarce, similar lignite is made to produce iron. It certainly contains more fixed carbon than turf, and yet the value of this latter fuel for smelting purposes is proved, and is becoming daily more highly estimated." It appears that some of this lignite has been charred and analysed by Prof. Herapath, who has found it to contain as follows: —Pure carbon, 9·96; sulphate of lime, 0·02; silic and soluble salts, 0·02—Total 100.

The Way Italian Peasants Eat.—The traveler, in passing along the fields of Italy in the morning, will see a kettle of Indian meal and water boiling over a fire. When the mush is cooked it is poured out upon a large flat stone, when the men, women and children gather around it, and take it up in their hands and eat it. At noon you will see the same process, and again at night. At first there was a prejudice against the American corn, as they call it, but now it is almost the only article of food among them.

SEPARATING GOLD AND SILVER FROM QUARTZ.

Gold and silver exist in their native state in more or less finely-divided particles in quartz, rock, sand, or earth, either pure or mixed with foreign substances. The usual method of obtaining these precious metals is to pulverise the rock or earthy matter containing them when necessary, and mix the pulverulent dust or sand with liquid quicksilver, by stiring or agitation together, by which the metalic particles are sought to be brought into contact with the quicksilver, and dissolved by the said liquid metal; the earthy matter is then separated from the amalgam, and the quicksilver subsequently distilled off from the pure metal. But many difficulties have hitherto arisen to prevent the extraction of all the gold and silver by this method. It is a well-known chemical law that chemical affinities take place at insensible distances—that is, upon actual contact. To enable the quicksilver, therefore, to seize and absorb all the particles of the precious metals contained in the metalliferous dust thus operated upon, it is essential that every separate particle should be touched by the quicksilver. Two hitherto insuperble difficulties have prevented this indespensable contact. The first is the fact that large portions of the gold and silver are found mixed and interblended with pyrites, sulphurets, and many other foreign and baser matters, which effectually coat over the outer surfaces of these metalic particles, and thus interpose between them and the quicksilver an obstruction to their amalgamation. The second is the fact that very large quantities of gold and silver exist in the quartz and metalliferous ores and earth in an infinitesimally fine and comminuted state, so light as to float in the air, and run away on the water which is employed in the various processes of washing and amalgamating. Besides, the difference of specific gravity is so great between the liquid and quicksilver and this invisible dust of gold and silver that it has hitherto been found practically impossible to amalgamate and save it. The consequence is that not more than one-half of the above-named precious metals is now obtained by any known method of amalgamation. Messrs. Adams and Worthington, of New York, have provisionally specified an invention, the nature and design of which are to overcome these very serious difficulties. The method of doing this is to reduce the metalliferous earth, ore, or quartz to an impalpable powder or as nearly so as possible, sift it into a chamber or cylinder, and at the same time distill into this chamber or cylinder the hot vapour of quicksilver through an atmosphere of which the said pulverised dust falls or mingles, and the amalgamation instantly becomes complete. The quicksilver distills at about 763° Fahrenheit. The vapour of the distilling quicksilver is, therefore, passed into the said chamber or cylinder, at or near this temperature, while the metalliferous dust is sifted into the top of the said reservoir at a lower temperature. In becoming mixed with the said vapour, the colder pulverised quartz or earth reduces its temperature, and condenses it in intimate and absolute contact with every particle of the gold and silver; the hot vapour interpenetrates the foreign substances that coat over the surfaces of the said metals, absorbs the minutest particles, and effect a complete amalgamation of all of the precious metals which the said pulverised quartz, ores, or sand contain. Moreover, the fine dust of gold and silver, which runs away on the top of the water in all processes of washing, is effectually saved. It is confined in an air-tight cylinder or chamber, and mingled in an atmosphere of the distilled vapour of quicksilver in a dry state, by which its lower temperature causes the said vapour, with increased affinity, to condense in contact with each impalpable particle of the gold and silver, amalgamate instantly with it, increase its specific gravity, and cause it to subside to the bottom with perfect facility when the mass is agitated with water, for the purpose of washing off the refuse earthy matter. From many experiments, carefully conducted, it is abundantly demonstrated that surfaces of metallic particles, so protected by dirt and foreign substances as to prevent the contact of liquid quicksilver, and, consequently, hinder amalgamation, are instantly interpenetrated by the hot vapour, and the said particles, thus enveloped, are readily dissolved and amalgamated with the said condensed vapour. The high hent at which the vapour condenses and seizes the metal increases the affinity between the two metals. The touch between the vapour and the precious metal is much closer than between liquid quicksilver and the said metal, because in the former case contact is complete on all sides—no way of escape is left. It is enveloped in an inpalpable and eliminated state in a hot atmosphere of the vapour of the distilled quicksilver, which vapour thus in contact with every metallic particle on all sides at a temperature of 763° Fahrenheit, or thereabouts, as soon as it touches the said particles of gold and silver gives up a portion of its calorie to the same, falls below its distilling temperature, condenses in perfect contact with the metal, amalgamates with it, and falls down at once by its added gravity. The excess of quicksilver also condenses, like dew, in the finest particles. The mass thus operated upon continuously falls down into a pan or reservoir underneath the chamber or cylinder, where it is kneaded together with water (hot, if possible), then dissolved by agitation in water, the earthy matter washed off, and the amalgam and condensed quicksilver obtained by subsidence at the bottom. The process is continuous and rapid, no vapour escapes, and the quicksilver is all condensed, and used over and over again.

Barrel Quartz.—On Laidlaw's Hill, forming the eastern division of the Waverly Gold District, Nova Scotia, has been found in great abundance, a peculiar variety of quartz-rock which has acquired a wide reputation under the name of *barrel quartz*. Mr. Philips, of London thus describes it:

The most remarkable deposit of auriferous quartz hitherto found in Nova Scotia is undoubtedly that at Laidlaw's Farm. The principal workings are here situated near the summit of a hill composed of hard, metamorphic shales, where openings have been made, to the depth of four or five feet, upon a nearly horizontal bed of corrugated quartz of from eight to ten inches in thickness. This auriferous deposit is entirely different from anything I had before seen, and when laid open presents the appearance of trees or logs of wood laid together side by side, after the manner of American corduroy road.

From this circumstance the miners have applied the name of "barrel-quartz" to the formation, which, in many cases, presents an appearance not unlike a series of small casks laid together side by side and end to end.

The rock covering this remarkable horizontal vein is exceedingly hard; but beneath it, for some little distance, it is softer and more fissile. The quartz is itself foliated parallel to the lines of curvature, and exhibits a tendency to break in accordance with these striae.

The heading, and particularly the upper surfaces of the corrugations, are generally covered by a thin bark-like coating of brown oxyd of iron, which is seen frequently to enclose numerous particles of coarse gold, and the quartz in the vicinity of this oxyd of iron, is itself often highly auriferous.

The corrugations, or folds, appear to be accounted for on the hypothesis of a lateral thurst producing the undulations. The value of the barrel quartz has been not so much from its large average yield of gold as from the comparative cheapness with with it has been mined. It appears from the statements in the Chief Gold Commissioner's Report, dated Jan., 1863, that each miner on Laidlaw's Farm averaged for the last three months of the previous year over nine tons per month, while in other districts the average monthly product per man was from two to three tons. The average yield of gold was small, about five pennyweights to the ton; the maximum being three ounces, not including remarkable discoveries like that of the Chebucto Company, of a mass of this quartz, yielding as already mentioned in he in roduction, for a volume of not over two cubic feet, over $4000 in value of gold.

Improvement in Dressing Gold and Silver Ores.—The appartus invented by Mr. J. J. Bonnard, of Paris, is distinguished from those ordinarily used by the separating process commencing at the lower part, the gangues passing in an upward direction, in contradiction to the usual method; this is effected by mounting wings, or blades, on a hollow axis, to which rotary motion is imparted by any suitable mechanism. These wings, or blades, serve to separate the ores from their gangues, which are discharged into a suitable receptacle. This improved separating apparatus consists of a cylindrical receiver of metal or other material, mounted on a suitable frame arranged for its reception, the hollow axis before mentioned passing down the centre of the said receiver, to the lower end of which are applied the wings, or blades, receiving rotary motion from bevil-wheels mounted at the upper part of the apparatus. The ore to be separated is received in a hopper at the top of the apparatus, which may have an oscillating or shaking motion imparted to it; a jet of water is also introduced for the purpose of carrying the ore down into the cylinder. The ore is conveyed through the hollow axis above mentioned to the lower part of the apparatus, where it is acted on by the blades, which in rotating produce the separation of the gangues, and cause them to enter two compartments forming a double casing round the inner chamber. The cylindrical chamber, as also the outer casing, should be completely filled with water; suitable cocks and a man-hole are applied at the bottom part of the receivers, the gangues passing out of the cocks of the outer casing, while the rich ore is withdrawn by means of the man-hole; this may also be facilliatted by causing the machine to oscillate, or by inclining the apparatus by the aid of a rack or other mechanical expedient.

Mining and Milling in Nevada Ter.—From Loryea's new Mining Stock Directory of the Territory, which was issued to-day, we gain the following information relative to mining matters in this city and Territory. About three thousand mining claims, averaging 1,500 feet each, have located in this country alone, of which 24 Gold Hill claims and 7 Virginia claims are paying dividends. There are 19 Gold Hill and 16 Virginia claims that will pay dividends in the prospective. This book says, that in the Territory the number of engines for hoisting works is 37, with an aggregate steam power of 1,923. The number of engines for mills, 85; steam horse-power 3,289; number of mills, 95; number of stamps, 1,359; crush per day, 1,791 tons; Arastra Mills, 10, containing in the aggregate 35 arastras; of the above mills 33 are worked by both water and steam power. In Esmeralda county there are 10 mills, with an aggregate of 103 stamps, and crush per day 122 tons of ore. In Reese river there are about nine mills in course of erection. There are about 12 engines in course of erection in Gold Hill, for hoisting works and six in Washoe Valley. The 95 mills on an average crush daily 1,791 tons of ore, at $30 per ton for crushing and transportation, making an aggregate cost of $53,730 daily—thus making an annual expenditure for carrying and crushing Quartz, of $19,611,450. *Daily Old Piute, of Virginia City, Nevada.*

New Method of Smelting Lead Ore.—One of the common methods of reducing this ore is to mix it with iron in a reverberatory furnace; the sulphur at a high temperature, having a stronger affinity for iron than for lead, leaves the lead and combines with the iron, forming sulphide of iron, while the lead is drawn off as a separate metal. Prof. A H. Everett, of New York, has just brought to perfection an important improvement in the process, by which a considerable saving in expense is effected. The high price, however, of even iron scraps at New York induced Prof. Everett to look about for some substitute, and it occurred to him to try the waste tin scaps of the tin-plate workers; in these he has the very best of wrought-iron, and in a form exposing the largest surface for the action of the sulphur. The tin scraps, being a waste product, can be had at a nominal cost. After a series of experiments the practical difficulties of the new process were

overcome, and now several tons of the ore are being smelted by it daily. The operation is extremely simple: 500 lbs. of the sulphide of lead mixed with 125 lbs. of tin scraps in a reveberatory furnace, and kept at an intense heat; the charge being stirred every fifteen minutes. In from one to two hours the whole mass becomes fluid, and the reduction is complete. It is found best to introduce one-half the charge of tin scraps, and allow it to become red hot, when the ore and the remainder of tin scraps are added. Besides the cheaper and more rapid reduction of the ore by this process, the tin of the scraps is mixed with the lead, increasing the yield, and for many purposes improving the quality.

ÆTNA, EMPIRE RESOLUTE AND GIRARD COPPER MINES.

Extracts of a letter dated Copper Harbor, Michigan, Aug. 17, '64.

"ÆTNA of course leads the van and justly deserves her good name, so far. We shall ship off a few tons of mass copper next week. In short we have mined copper enough to more than pay the mining expenses. Our costs of machinery and improvements are large, but no more than is absolutely necessary to put the mine in good condition, for another year, when we hope our product will far exceed our expenses—and should the mine continue as it has commenced we most certainly can do it.

EMPIRE continues to improve. We are getting out small masses or chunks of copper from 20 to 100. lbs. every day: one piece of some 500 lbs. came out a few days since that stuck above the surface some four inches, and there are now in sight lots of nuggets and shot of pure copper all along in the vein fracture. Empire is all right and safe.

RESOLUTE.—This, is, in imagination, a very remarkably rich mine. We have to judge, as yet, what it will be in depth, from what we see upon the surface. Unless it proves to be one of the richest and most profitable mines ever opened on Lake Superior, then put me down as over sanguine and a man of very poor judgment.

GIRARD continues to improve and looks first rate; their work is moving along in good shape, and will tell well in time."

LIGHTING MINES.—As an improvement in supplying air to lights in mines, the Rev. W. R. Bowditch, of Wakefield, proposes to condense air by a pump, or other suitable means, and convey it in pipes to a receiver, and thence to the light to be supplied, or directly from the condenser to the light. The light, naked or in a safety-lamp, is placed in a lantern, which has an aperture for the admission of the pure air, and one or more apertures for the exit of the air and product of combustion. The condensed air is conducted through a pipe, which fits tightly into the lantern, and by this air combustion is supported. The surplus air, and the products of combustion pass out through the apertures made for that purpose in the lantern. The air being supplied to the lantern under pressure, prevents the entry of fire-damp or any other dangerous gas that may surround the lantern. Air under pressure is apt to extinguish lights supplied with it, and to flow to waste if the current be not regulated; to prevent this he passes it through a pipe or pipes, obstructed by screw-plugs, or taps, or wire, or by combinations of these, or by other suitable impediments, so that its flow may be regulated according to the supply needed. He also uses the waste air blown off from engines worked by compressed air. In this case, the air which is blown off is received into a suitable box, with a valve, before it is allowed to mingle with the atmosphere, and it is conducted from the box to the light through a pipe or pipes, as described. He also allows the air to escape around lights, without enclosing them, but this plan is not so efficient or economic.

The per centum of copper per ton of ore crushed obtained in 1863 at the Quincy mine, Portage Lake, Michigan, was 2·75.

GAS.

PATENTS RELATING TO WATER GAS.

The following list of Patents was compiled by Prof. Wurtz, and was published in a pamphlet issued by the Manhattan Gas Co., entitled "History and value of "Water Gas Processes." Abstracts from the most important patents relating to Water Gas down from the earliest times have been made, forming a condensed and historical review.

1. June 3, 1823: WM. VERE & HY. SAMUEL CRANE, whose inventions consists "in the application or admission of a continued stream of water, or of a continued current of steam, into the retort or other vessel where coal, coal tar, tar oil, animal oil or vegetable oil, is under the process of decomposition for the purpose of producing inflammable gas."

2. May 15, 1824: JOHN HOLT IBBETSON admits "steam into the decomposing chamber, when in operation, among the ignited coal or coak, alone or mixed with tar or oil."

3. April 5, 1830: PINKUS & COLLIER, who admits into a coal gas retort, when in action, "an excess of ammoniacal or hydrogen gas."

4. October 6, 1830: MICHEL DONOVAN, who brings the gas produced by the action of steam on heated coke into contact with the liquid or vapor of spirits of turpentine, spirit of vegetable tar, coal naphtha, naphthaline, etc., heated or otherwise.

5. October 12, 1831: GEO. LOWE, naphthalizes ordinary coal gas.

6. June 9, 1832: GEO. LOWE, same subject.

7.————, 1834: M. JOBARD, of Brussels, passes the gases derived from the decomposition of water over resinous bodies while undergoing distillation, also through "oil of gas tar." I find it stated that such a patent as this exists, though I have been unable to discover any record of it. Some authorities assert that Jobard was substantially the originator of the inventions on which the water gas patents of Selligue, next enumerated, were founded,

8 to 16. June 30, 1834; Sept. 19, 1834; Dec. 11, 1834: Jan. 6, Nov. 27, 1835; Feb. 9, 1836. April 13, 1836, and Aug. 27, 1836: ALEXANDER FRANCOIS SELLIGUE, Three vertical cylinders were heated to redness—two being filled with charcoal, the third with chain and pieces of iron. A thin stream of water was made to flow into the first cylinder. The gaseous products passed into the third retort in which a stream of "shale oil" was being decomposed by the red-hot iron. Under this head, at least eight patents were issued, as above, in France, involving a great multitude of details, for which I must refer to the French "*Brevets d'Inventions*," *1st series, tome 7, pp.* 269–285. Abridged accounts of these inventions may also be found in the *Bulletin de la Societe d'Encouragement*, Oct., 1838, p. 396, and in Dingler's polyt. Jour., lxxi, pp. 29–33.

17. Sept. 25, 1834 (English patent): Jean Baptiste Mollerat, of Dijon, passes either pure hydrogen or a mixture of hydrogen and carbonic oxyd from the decomposition of water by red-hot carbon, through volatile oil of tar, naphtha, petroleum, etc., to obtain light.

18.—— ——, 1835: GILBERT SANDERS transmits steam through a succession of red-hot retorts filled with coke or charcoal, to convert the carbonic acid produced fully into carbonic oxyd; the remaining carbonic acid being then removed by transmission through cream of lime, and the gas then passed into another red-hot retort together with tar, turpentine, resin, oil of resin, petroleum, asphaltum, bitumen (natural or artificial), naphtha, vegetable or animal oils, tallow, caoutchouc, or the volatile oils produced by previously distilling any of these substances.

19. May 2., 1837 (English patent): JEAN BAPTISTE MOLLERAT, of Dijon, passes the mixture of hydrogen and carbonic oxyd from water and red-hot carbon, through red-hot coals, and brings it in contact, at the same time, with vegetable and mineral oils, in a state of vapor, in order to make an "absolutely permanent" compound, incapable of condensation on cooling,

20. Feb. 28, 1838: MONTAUBAN & MEDEIROS prefer, "when oil, resins, tar, pitch, bitumens, schistus, etc., are used for making gas, the application of water or steam in the process."

21. May 8, 1839: EDWARD OLIVER MANBY passes steam into a retort, containing anthracite, charcoal, coke, or bituminous coal, heated to redness, to make water gas. The steam is supplied to the retort by a pipe, which passes through the furnace, "in which pipe the steam becomes heated to a considerable temperature."

22. June 22, 1839: J. A. P. de VAL MARINO. Three retorts are heated to a high degree, and filled with coke or charcoal. Water, in suitable quantity, is allowed to flow into the first retort, and the steam and gaseous products, thus arising, are passed on to, and through, the second retort, and finally through the third retort, which is supplied with tar, etc, for decomposition. The patentee asserts that "carburetted hydrogen gas thus manufactured, will not require purifying."

23. July 3, 1839: ALEX. CRUCKSHANKS. A current of steam is caused to pass into the gas retort while gas is being produced. The steam is superheated previously, by passing the pipe through the furnace. The steam is generated by passing the waste heat of the furnace and the escape pipe from the retort through some water. In this patent is included also the device for increasing the light of a flame of common gas, or hydrogen, by placing a cone or cage of fine platinum wire (which may be coated with chalk or lime) over the flame, so as to enclose the flame and touch the outer surface. This last invention is generally credited to Gillard, whose claim dates, however, as shown below, ten years later. Ronalds & Richardson, in their Technology, fall into this error. [See vol. 1, p. 644, of that work.]

24. March 16, 1843: JAMES MALAM makes carburetted hydrogen gas by passing steam, with the vapor from tar, into heated retorts.

25–26. March 7, 1844: CROLL & RICHARDS mix together zinc, water, oil of vitriol and naphtha, or other volatile combustible liquid, to obtain hydrogen gas impregnated with the vapor of the hydrocarbon, for illuminating purposes. This old plan has been revived quite recently in an American patent, granted Jan. 15, 1856, to DAVIS & CUNNINGHAM.

27. Feb. 20, 1845: JAMES MURDOCH decomposes water by means of incandescent coke or charcoal, to obtain hydrogen gas, in connection with retorts for making gas from coal, "resinous and essential oils, schistus and similar substances."

28. June 23, 1845: WM. POLLARD applies a blast of highly heated steam, in conjunction with air, to convert solid fuel into combustible gases, in suitable furnaces.

29. May 3, 1845: WM. RADLEY "dilutes gases, of rich illuminating power, with hydrogen, of greater or less purity, or by light carburetted hydrogen, to any required standard of density." Also passes a mixture of vapors of hydrocarbons, mixed with steam, through a mixture of quicklime, coke and scrap iron, heated to redness.

30. April 15, 1847: STEPHEN WHITE decomposes "water, by bringing it into contact with charcoal, or coke, or anthracite and small thin plates of iron, or small pieces of thin iron wire, or with charcoal or coke, or anthracite and lime, at a very high temperature, thereby producing, from such combination of material so aerated, hydrogen gas and carbonic oxyd gas mixed, and afterwards combines such compound gas with carburetted hydrogen gas, (produced by bringing oil, or fat, or tar, or certain other substances, in contact with heated materials,) so as to produce ultimately a compound gas, fitted for illumination" Three retorts are used, two of which have within them colanders, filled with thin iron plates or wires, and filled up round the colanders with charcoal, coke, or anthracite, and heated to whiteness, either in a furnace (placed vertically,) or by means of a "Daniell's Galvanic Battery," and a thin stream of water made to enter the top of the first retort and percolate downwards. The oil, fat, tallow or tar is fed into the third retort, which is kept at

a moderate red heat, and sometimes has small iron chains coiled or suspended in it

31. Nov. 11, 1847: Chas. Blachford Mansfield passes air or other non-inflammable gas through benzole, thus charging it with the vapor of this highly volatile liquid, and then burns the product for illuminating purposes.

32. March 26, 1849: Stephen White; different arrangement of apparatus for carrying out the operations patented before, April 15, 1847. These patents issued by both the United States and Great Britain; the U S. patents dated Jan. 22, 1850.

33. Nov. 22, 1849: Jos. Pierre Gillard produces hydrogen gas by various means. 1st, by decomposing water by "incalescent iron;" he also sometimes uses coal, charcoal, etc., in connection with his iron, and recommends that the steam should be distributed over the surface of the coal in the retort by means of "one or more pipes pierced with holes" of small diameter. 2d, by decomposing water by means of magneto electric machines. He also claims the plan before patented, as above, by Cruckshanks, July 3, 1839, of rendering hydrogen illuminating by means of wicks and sheets of excessively fine platinum wire.

34. Feb. 12, 1850: Jas. Webster passes steam into the back end of a heated retort which is filled with "pieces of iron and black-lead in powder," and then into another retort containing coal, through a perforated sheet of metal.

35. June 12, 1850: A. V. Newton. (A communication from some foreigner to an English patent agent.) Among other matter, for producing hydrogen gas by decomposition of water by a magneto-electric machine (also included in the patent of Gillard, Nov. 22, 1849, as above); then "catalyzing or rendering luminiferous" this hydrogen gas by "passing it through spirits of turpentine or other hydrocarbon at common temperatures." This appears to be the celebrated "Paine's water gas" patent, which made so much noise about that period. It will be remembered that one of the incredible pretentions advanced for this method was, that the turpentine or other hydrocarbon *did not waste* in the operation, but that the luminiferous power acquired by the hydrogen was due to some mysterious change in its nature, indicated by the word "catalyzing."

36. April 15, 1851: Barlow & Gore pass steam, heated to a high degree, first over incandescent coke, and then over the coal which is being converted into gas. In preference, the gas evolved from the steam and coke should be passed through a suitable condenser, to withdraw the excess of steam, before entering the coal retort, and it may be caused also to pass through lime, carbonate of soda, or borax solutions to remove the carbonic acid.

37. May 29, 1851 (Great Britain) Oct. 29, (U. S.) Henry W. Adams, Bostonian, charges a heated retort with zinc, and passes through it a stream of steam, then passes the hydrogen thus evolved through volatile hydrocarbons; or else passes this hydrogen into another retort, where he combines it "with decomposed oil, rosin, tar, melted pitch, or some analogous carbonaceous matter, thus forming a permanent gas." Claims "a mode of decomposing water and manufacturing oxide of zinc for commercial use, such mode embracing the use of retorts." Heats his retorts "sufficiently to vaporize the zinc,"

38. Jan. 24, 1852: F. C. Hills passes steam alone, or mixed with hydrocarbon vapors, over coke, in red hot retorts, modifying the same in various ways.

39–40. July 22, 1852: Jno. & Thos N. Kirkman decompose steam by passing it through the fire of a furnace, and then pass the gas into retorts containing coke heated to a high degree, then through other retorts containing cannel coal, or tar, oil, pitch, rosin, etc There is another similar patent issued to the same parties, Aug. 28, 1854.

41. Jan. 13, 1853: William Brown places coal, etc., in a heated retort, and introduces heated steam.

42. Nov. 4, 1853: Wm. Gisbert Ginty makes a mixture of hydrogen and carbonic oxyd, by passing steam over coal, anthracite, iron, etc., for various purposes.

43. June 23, 1854: Thos. Isaac Dimsdale introduces into a gas retort, during the distillation of the coal, jets of superheated steam, to "cause its elements to combine in a nascent state with gases from the coal."

44. Aug. 22, 1854: Augustin Jacquelain proposes, in making water gas, to expose the carbon to *an excess* of highly heated steam, which he asserts will produce carbonic acid and no carbonic oxyd, and then absorbs the carbonic acid by lime, and passes the residual hydrogen through a retort containing decomposing coal. He also mixes the water gas obtaind by any of the ordinary means with an excess of steam at a high heat, which he says converts the carbonic oxyd into carbonic acid, and then absorbs the latter by lime.

45. Jan 3, 1855: Felix Gabriel Celestin Dehaynin passes the mixture of hydrogen and carbonic oxyd, from action of steam on heated carbon, over hydrated caustic soda at a high temperature, stating that the following reaction takes place $NaO, HO \times CO = NaO, CO^2 \times H$. The object being to obtain pure hydrogen.

46–47. June 20, 1855: Wm. Cartwright Holmes distils oil, resin, peat coal, etc., by superheated steam. A supplementary patent issued Feb. 2, 1858.

48. June 28, 1855: A. E. L. Bellford (English Patent Agent, on behalf of a foreigner.) A jet of steam saturated with tar or other hydrocarburet, is let down through a layer of incandescent coke.

49. Aug. 10, 1855: Lancaster & Smith introduce into an ordinary gas retort a certain quantity of charcoal, along with the coal, and pour water, or admit steam, into said retort during the distillation.

50 Sept. 11, 1855: E. Z. C. Bouchard employs the waste heat from the fuel used in making coal gas, to generate steam and hydro-carburetted vapors, and mixed one or both of these with the coal gas at the time of its production.

51. Oct. 13, 1855: Adolphe Germain Thirierge produces hydrogen, chlorine and sesquioxyd of iron, as follows: muriatic acid gas, artificially dried, is passed over metallic iron, in a suitable vessel, at a high temperature, producing hydrogen gas and protochlorid of iron. The hydrogen may be used for heating, lighting, etc The protochlorid of iron is submitted, in a similar heated vessel, to a current of dried air, which sets free chlorine gas for bleaching purposes, with formation of sesquioxyd of iron.

52. June 17, 1856: Jacinto Dias Damazio connects two coke ovens with a heated cylinder, containing coke in small pieces. The coke ovens are charged in rotation with coal, lighted, and allowed to burn for a time; the gases therefrom being then passed through the coke cylinder. Superheated steam is also introduced into the coke cylinder, "to improve the gas."

53. Feb 24, 1857 (U. S patent:) Choate & Tyler, of Washington, D. C., mix hydrogen gas with gas from wood.

54. Sept. 9, 1857: Edward Lavender subjects coal to the action of superheated steam, "introduced under a perforated false bottom, on which the coal is placed," in a chamber or vessel, which is not to be externally heated.

55. Nov. 2 1857: Mathieu Francois Isoard: consists in "carburetteing superheated steam, by causing it to traverse hydrocarbons of any kind." Proposes his product both for heating and lighting.

56. Feb. 2, 1858: Holmes & Hollingshead, in the distillation of gas from coal, by means of superheated steam, conduct "the vapors or gases thus obtained from the retort to another vessel, where they are still further subjected to the action of superheated steam," etc. "The superheated steam may be introduced into the separate vessel as also into the retort itself, through holes or perforations."

57. Oct. 16, 1858: Joseph Pierre Gillard "generates hydrogen by the decomposition of steam, by causing same to come in contact with charcoal, or any other suitable material, at a suitable heat." "The steam is divided over the material, by means of suitable perforated tubes."

58. Nov. 15, 1858: Alex. M. Bruere passes hydrogen gas through the mass, in distilling gas from coal. Says that "it will be found that by introducing a current of hydrogen gas into the retorts, gas of a far superior illuminating power to that produced by the ordinary means will be obtained."

59 Nov. 27, 1858: Henry Gernet converts steam into hydrogen by passing over red hot scrap iron, and mixes this hydrogen with rich hydrocarbon gas, produced from a liquid hydrocarbon, the hydrogen gas "taking up and combining with the excess of carbon that would otherwise be deposited in the retort."

60. June 21, 1859 (U. S. Patent): Chas. N. Tyler claims "combining hydrogen gas with the volatile and easily condensible products of coal, resin, tar, etc., in their nascent state."

VAST ARMIES.

There has been vast armies and mighty movements of soldiers in ancient times. Here is a record of some of them:—

Sennacherib (the Bible tells us) lost in a single night 185,000 men by the destroying angel.

The city of Thebes had a hundred gates, and could send out at each gate 10,000 fighting men and 200 chariots; in all, 1,000,000 men and 2000 chariots.

The army of Terah, king of Ethiopia, consisted of 1,000,000 of men and 300 chariots of war.

Sesostris, king of Egypt, led against his enemies 600,000 men, 24,000 cavalry, and 27 scythe-armed chariots—1491 years before Christ.

Hamilcar went from Carthage, and landed near Palermo. He had a fleet of 2000 ships and 3000 small vessels, and a land force of 300,000 men. At the battle in which he was defeated, 150,000 men were slain.

Ninus, the Assyrian king, about 2,200 years before Christ, led against the Bactrians an army of 1,700,000 foot, 340,000 horses, and 16,000 chariots armed with scythes.

Semiramis employed 2,000,000 men in building Babylon. She took 100,000 prisoners at the Indus, and sank 1,000 boats.

A short time after the taking of Babylon, the forces of Cyrus consisted of 600,000 foot, 120,000 horses, and 2,000 chariots armed with scythes.

An army of Cambyses 50,000 strong, was buried up in the desert sands of Africa by a south wind.

When Xerxes arrived at Thermopylæ, his land and sea forces amounted to 2,614,610, exclusive of servants, eunuchs, woman, sutlers, etc., in all numbering 5,283, 220. (So say Herodotus, Plutarch, and Isocrates.)

The army of Artaxerxes, before the battle of Cunaxa, amounted to about 1,200,000 men.

Ten thousand horse and 100,000 foot soldiers fell on the fatal field of Issus.

The Mechanical Hair Brush.—A gentleman who has submitted himself to the operation of the mechanical hair brusher, describes the sensation produced by it as follows:

When I went in to get my hair brushed, had sat down before the glass, and been tucked in as usual, with bib and dressing-gown, the hair-dresser took up one of his circular brushes and hitched it to the revolving band over my head. In a moment I felt a silent fanning, as if some monstrous butterfly were hovering over me; this was the air of the twirling brush, which caught my hair up and laid it down, and traveled all over my head with incessant gentle penetration. It crept down my whiskers and searched my beard with the same tender and decided effect. There was no scratching, not even of the neck and ears, but the skin of the cheeks and chin was reached and swept. It was a new sensation I felt as if I should like to be brushed continuously for a month.

Thoughts.—Unspoken thought are virgins. They must be wedded to words ere they can attain perfect existence; and once united, they live and bear fruit forever. No decree can divorce them.

Dew is an invisible vapor, which, chilled by the cool surfaces of the flowers, burts into tears over the beauty that must fade.

DUCTILITY OF GOLD.

Gold leaf is usually employed to illustrate the extreme ductility of gold; but the film of gold on the surface of gold lace is not more than one-tenth the thickness of ordinary gold leaf. The making of the wire which constitutes the covering of the silken thread out of which gold lace is made is a most curious and wonderful piece of mechanism. The process of its manufacture is as follows:—

In the first place, the refiner prepares a solid rod of silver about an inch in thickness; he heats this rod applies on the surface of a sheet of gold leaf, burnishes this down, and so on, until the gold is about one-hundreth part the thickness of the silver. Then the rod is subjected to a train of processes which brings it down to the state of a fine wire; it is passed through holes in a steel plate, lessening step by step the diameter. The gold never deserts the silver, but adheres closely to it, and shares its mutations; it is one-hunreth part the thickness of the silver at the beginning, and it maintains the same ratio to the end.

As to the thickness to which the gold-coated rod of silver can be brought, the limit depends on the delicacy of human skill; but the most remarkable example ever known was brought forward by Dr. Wollaston. This was an example of solid gold wire without any silver. He procured a small rod of silver, bored a hole through it from end to end, and inserted in this hole the smallest gold he could produce; he subjected this silver to the usual wire drawing process, until he had brought it to the finest attainable state—being, in fact, a silver wire as fine as a hair, with a gold wire in its center. To isolate this gold wire he subjected it to warm nitrous acid, by which the silver was dissolved, leaving a gold wire one thirty-thousandth of an inch in thickness—perhaps the thinnest round wire that the hand of man has yet produced. But the wire, though beyond all comparison finer than any employed in manufactures, does not approach in thinness the film of gold on the surface of silver in gold lace, which is not above one-tenth the thickness of ordinary gold leaf.

RECIPE FOR (PERHAPS) MAKING DIAMONDS.

It may be remembered by our readers that we lately suggested the possibility of making artificial diamonds, if a solvent of carbon could be discovered, which would lift and deposit it as alum is lifted or solved in water, and deposited in the crystalline form of alum baskets. Thereupon a correspondent suggested that failing the obtainment of such a solvent, perhaps electricity could be brought to bear upon a carbonaceous solution, so as to cause the carbon to be deposited pure in a crystalline form. The subject seems to have excited some attention; and a writer in the "Dublin University Magazine," thus deals with it:—"Diamond when fused by the heat in the open air, leaves a residue of pure carbon. Its attraction for solar light is so great that, after absorption, it is sure to give it off when placed in a dark room. Its extreme refrangibility shows it to have for its base an oily substance. It is a bad conductor of electricity, like all such substances. Suppose we take a portion of pure carbon (which is a powerful conductor of electricity), produced by burning to sooty residue a quantity of vegetable oil, say oil of origanum, which is the most inflammable; then place it in a close air-tight vessel constructed so as to admit a saturating supply of oxogen (which is a powerful conductor of electricity); then bring to bear on this intensely oxygenised piece of carbon a strong and constant electric current. While the latter produces volatilisation and intense molecular aggregations, it is very possible that the union of oxygen with the carbon, under such conditions, would result in the re-construction of diamond substance, which would take a crystallized form under the influence of the current; while the oxygen would restore to the diamond base the quality which it had lost. The instrument should be exposed constantly in the light of the sun, which exercises such influence on crystallisation; and as the harder the crystals the longer the time it takes to form, the process of the experiment would of necessity be extended over several or many years." So, it may be some little time ere we can report the result of such an experiment as this.

Statistics of the Globe.—The earth is inhabited by 1,288,000,000, of inhabitants, namely, 396,000,000 of the Caucasian race; 552,000,000 of the Mongolian race; 196,000,000 of the Ethiopian, 1,000,000 of the American Indian, and 200,000,000 of the Malay races. All these respectively speak 3,064 languages and profess 1,000 different religions. The amount of deaths per annum is 333,333,333, or 91,954 per day, 3,730 per hour, 60 per minute, or one per second; so that at every pulsation of our hearts a human being dies. This loss is compensated by an equal number of births. The average duration of life throughout the globe is 33 years. One-fourth of its population dies before the seventh year, and one-half before the seventeenth. Out of 10,000 persons only one reaches his hundredth year, only one in 500 his eightieth, and only one in 100 his sixty-fifth. Married people live longer than unmarried ones, and a tall man is likely to live longer than short one. Until the fiftieth year woman have a better chance of life than men; but beyond that period the chances are equal. Sixty-five persons out of 1,000 marry. The month of June and December are those in which marriages are most frequent. Children born in spring are generally stronger than those born in other seasons. Births and deaths chiefly occur at night. The number of men able to bear arms is but one-eighth of the population. The nature of the profession exercises a great influence on longevity: thus, out of one hundred of each of the following professions, the number of those who attain their seventieth year is—among clergymen, 42; agriculturist, 40; traders and manufacturers, 33; soldiers, 32; clerks, 32; lawyers, 29; artists, 28; professors, 27; and physcians, 24; so that those who study the art of prolonging the lives of others, are most liable to die early, probably on account of the effluvia to which they are constantly exposed. There are in the world 355,000,000 of Christians, 5 000,000 of Jews, 600,000,000 professing some of the Asiatic religions, 160,000,000 of Mohammedans, and 200,000,000 of Pagans. Of the Christians, 170,000,000 profess the Catholic, 76,000,000 the Greek, and 80,000,000 the Protestant creeds.

Gun Powder—A New Invention.—Capt. Edward Schultze, of Potsdam, England, has invented an improved mode of manufacturing gunpowder. He proposes to take the natural grown-up trunks of trees, clear them from the roots and the bark and to cut these trunks into thin plates of the diameter of the trunks themselves. These timber plates are cut by machinery into little grains of equal length and breadth with the thickness of the plates. The timber grains so obtained will become the powder grains. The first object of the chemical labor is to obtain the grains as porous as possible, and to clear them from all external mechanical substances. This is obtained by the application of chloride, and then of nitrous acid; these grains are made explosive by nitrate of potash, and in some instances by "kaliferrohydrocyanicum." The proportions are varied, according to the purpose for which the powder is to be used. In case the powder is to have a more gradually acting, not very explosive force, the first combustible material (namely, the flammable but not explosive grains) will be ground into dust. This dust is then treated by the same process of the above mentioned mixtures to produce the explosive power. From the matter so obtained a kind of cake of relative strength is produced by means of pressure, and these cakes are the material from which by the necessary machinery the powder grains may be obtained.

A Boy near Downsville was poisoned the other day by eating wild berries. That which was peculiar in the post mortem was that nearly all the external surface of the body was covered with patches of livid hue, whilst no red blood was discovered in the internal organs.

The wild men of Oronsko said to a priest: "Thou keepest thy God in a church, as if he was sick and needed care. Our God is on the mountain top, directing the storm, and guarding us in the still watches of the night."

HEAT AND FORCE.

Whenever friction is overcome, heat is produced; and the amount of heat so produced is the exact measure of the force expended in overcoming the friction. Says a distinguished lecturer, while speaking upon the subject of "Heat Considered as a Mode of Motion:"—"We usually put oil upon the surface of a hone; we grease the saw, and are careful to lubricate the axles of our railway-carriages. What are we really doing in these cases? Let us get general notions first; we shall come to particulars afterwards. It is the object of the railway engineer to urge his train boldly from one place to another. He wishes to apply the force of his steam or his furnace, which gives tension to the steam to this particular purpose. It is not his interest to allow any portion of that force to be converted into another form of force which would not further the attainment of his object. He does not want his axles heated, and thence he avoids as much as possible expending his power in heating them. In fact he has obtained his force from heat, and it is not his object to reconvert the force thus obtained into its primitive form. For by every degree of temperature generated by the friction of his axles, a definite amount would be withdrawn from the urging force of his engine. There is no force lost absolutely. Could we gather up all the heat generated by the friction, and could we apply it mechanically, we should by it be able to impart to the train the precise amount of speed which it lost by the friction. Thus every one of those railway porters whom you see moving about with his can of yellow grease, and opening the little boxes which surround the carriage axles, is, without knowing it, illustrating a principle which forms the very solder of Nature. In so doing he is unconsciously affirming both the convertibility and the inlestructibility of force. He is practically asserting that mechanical energy may be converted into heat, and that when so converted it cannot still exist as mechanical energy, but that for every degree of heat developed a strict and proportional equivalent of *locomotive force* of the engine disappears. A station is approached say at the rate of thirty or forty miles an hour; the brake is applied, and smoke and sparks issue from the wheel on which it presses. The train is brought to rest: how? Simply by converting the entire moving-force which it possessed at the moment the brake was applied, into heat.

How Birds Cling to a Limb.—How ingenious are the springs which move the feet of birds? It is not by a play of the muscles which their immediate will determines, that they hold themselves firm on a branch; their feet are so constructed that, when they are pressed in the centre or at the heel, the toes naturally grasp the object which presses against them. From this mechanism it follows that the claws of a bird adhere more or less rapid; for, in the waving of the branch, either the branch presses against the foot or the foot against the branch, and in either case there results a more forcible contraction of the claws. When in the winter season, at the approach of night, we see ravens perched on the leafless summit of the oak, we imagine that it is only by continual watchfulness and attention, and with incredible fatigue, they can maintain the position amid the howling tempest and the obscurity of the night. The truth is, however, that unconscious of danger, and defying the storm, they sleep amid the war or winds. Boreas himself fixes them to the branch from which we every moment expect to see them hurled; and, like the veteran mariner whose hammock is slung to the masts of a vessel, the more they are rocked by the hurricane the more profound are their slumbers.

The whole number of Petroleum refineries at Pittsburg is fifty-eight, with a total capacity per week of 26,000 barrels. Value of real estate, buildings and machinery, $2,534,000; value of oils refined, $8,599,223; wages paid per annum, $350,000.

Petroleum by weight.—At a meeting of the Petroleum committee, of the city of London, England, it was determined that, on and after June 1, 1865, petroleum be sold at per ton of 20 cwt.

THE AMERICAN GAS-LIGHT JOURNAL AND MINING REPORTER is published on the 2d and 16th of every month, and is a recognized official organ of—

LIGHT, HEAT, MINING INTERESTS.

PETROLEUM, WATER-SUPPLY, AND SCIENTIFIC SUBJECTS GENERALLY.

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PUBLISHED ON 2D AND 16TH OF EVERY MONTH.

JAMES W. BRYANT, ... EDITOR.

FRIDAY, SEPT. 16th, 1864.

BACK NUMBERS WANTED.—We want to complete our files of the Journal, the following numbers, for which we are willing to pay full price.

Vol. II—No.'s 13, 22, 24, 25, 29 and 34.
Vol. III—No.'s 40, 42, 44, 47, 48, 52 and 56.
Vol. IV—No.'s 63, 64, 67, 68, 69, 70, 72, 74, 80, 82, 83.
Vol. V.—No.'s 91, 93, 95 and 96.

Those of our subscribers who do not bind the Journal, would do us an especial favor by forwarding to us any of the above numbers. We are being constantly called upon to furnish back issues of our paper by those who value it for future reference, and we have supplied them until all of the above numbers are exhausted.

☞ Those of our subscribers who have remitted the price of their annual subscription to us, and have not received in return their receipt, will please notify us of the fact.

THE AMERICAN ARTISAN.—There is no paper that comes to our desk which we welcome more cheerfully than the above named periodical. We cannot conceive how any artisan can do without it. We always rise up after its perusal better informed than when we sat down with it in hand. We recommend every man or woman who reads at all, to subscribe for the American Artisan—its price is but $2 per annum, in advance.

SOLDERING WATER-PIPES.—When it is necessary to solder full water-pipes, that are broken off where it is inconvenient to shut off the water, let the plumber plug up both ends; then surround the two portions of pipe near the fracture with ice and salt. In a few moments the water within the pipe will be frozen solid. The plugs may now be withdrawn, the fracture repaired, the salt and ice removed, and the water soon commences its flow again.

The Pittsburg Dispatch learns from a reliable source that a congregation in Youngstown, Pa., were lately edified by a discourse against the sinking of oil-wells, on the ground that God intended these oil deposits for some great conflagration, or other purpose, which was being interfered with by the well-borers.

By the last statistics of Australia, we learn that there are only 2,500 Americans in those British colonies. Five years ago there were about 10,000, but most of them have gone to California.

MANUFACTURE OF FATTY ACIDS FOR CANDLES, ETC.

Medge-Mouries has occupied himself with investigating this subject, and states that he has found that fatty substances, in the condition of very small globules, possess very peculiar qualities, for instance they do not get rancid on exposure to damp air, and are saponified with far greater rapidity and completeness than in the solid or fluid form. This globular condition is produced by mixing the melted fat with water containing yolk of egg, bile, albuminous matters, soap, etc. Soap is used in practice; tallow or suet, for instance, being agitated with water at 113° F. holding in solution from 5 to 10 per cent. of soap. On adding the alkaline ley, each globule of the fat, being attacked on all sides by the liquid, abandons its glycerine with such rapidity as speedily to produce a liquid in which each globule is a perfect soap globule, inflated with lixivium. The saponification with soda can be effected in two or three hours. The saponified globules, exposed to a heat above 140° F., gradually reject the lixivium with which they were distended, and form a layer of melted soap above the lixivium, which retains the glycerine. This soap, decomposed by sulphuric acid, yields a mixture of fatty acids which, pressed cold, yields inodorous stearic acid fusible at 137½° or 138° F., and an oleic acid which is almost colorless. The increased expense of soda over lime is more than repaid by the superior quality of the oleic acid. The proportion of fatty acid present which is recovered is 96 per cent. An operation on 2000 kilogrammes occupies but 19 hours, 8 hours of which (during the night) is occupied in the crystallization of the fatty acids before pressing. The oleic acid is used for making the best qualities of soap.

[The method of distillation is that generally used in this country, I believe, for the manufacture of candle-stock, by which the oleic acid is obtained as "red oil." If the new method of saponification of Pelouze, by means of a lye of sulphid of sodium, were found applicable to the case, we might probably avail ourselves of Mege-Mouries's observations in this country to much advantage.—H. W.]

AMERICAN LAMPS IN ENGLAND.—The London Oil Trade Review says: Messrs. Dietz & Co., Petroleum lamp manufacturers of New York, have opened a branch establishment for Great Britain in St. Paul's buildings, London. The show-room is replete with one of the handsomest and most varied stock of lamps we have seen, and among them are several new and chaste designs—chiefly American. We understand that Messrs. Dietz & Co. are taking measures to extend considerably their trade with our country, and if we may form an opinion of the probable result from our enormous and increasing trade in lamps of American manufacture, we have no doubt that their endeavors will be successful. We have frequently called the attention of the trade to the limited efforts of our lamp manufacturers to supply the English and Continental markets, and to keep pace with the rapid extension of the trade and foreign competition, and now it is a very prominent fact, and one that should be well considered by English makers, that American designs in lamps are with us the favorites, so far as the general public are concerned, and the Continent have supplied us with a large proportion of the superior and more expensive descriptions. Many of the most popular improvements which have been patented in England are well known to be of American origin. As far as our observation has gone, we find that English makers have found it answer their purpose to copy designs or work under a royalty. About twelve months since we called attention to the dearth of common lamps in Paris, and we believe that the want was supplied principally by American dealers. Our makers should look to their laurels.

We insert the following paragraph of the new revenue law, defining the tax on mineral oils, viz.:

"On coal illuminating oil, refined and naptha, benzine, and benzole, produced by the distillation of coal, asphaltum, shale, peat, petroleum, or rock oil, and all other bituminous substances used for like purposes, a duty of 20 cents per gallon: Provided, that such oil, refined and produced by the distillation of coal, asphaltum, or shale, exclusively, shall be subject to pay a duty of 15 cents per gallon, anything to the contrary notwithstanding: And provided further, that distillers of coal oil or naptha, benzine or benzole, shall be subject to all the provisions of law applicable to distillers of spirits with regard to licenses, bonds, returns, assessments, liens, penalties, drawbacks, and all other provisions designed for the purpose of ascertaining the quantity distilled and securing the payment of duties, so far as the same may, in the judgment of the Commissioners of Internal Revenue, and under regulations prescribed by him, be deemed necessary for that purpose: And provided, also, that naptha of specific gravity exceeding 80 degrees, according to Baume's hydrometer, and of the kind usually known as gasoline, shall be subject to a tax of 5 per centum ad valorem."

A NEW GAS ENGINE.—An improved "gazomoteur," the invention of Mr. Belou, has been successfully introduced at the paper factory of Mr. Anzin, near Paris, and has been favorably reported upon by the Academy of Sciences. It is stated that the machine possesses an economy equal to 60 or 70 per cent; it consists of three principal parts—an air-pump, a smoke-consuming furnace, and a motive cylinder. The furnace, when the engine is at work, remains closed, unless at the orifice by which the air-pump opens on it, and the one by which the heated air sets the cylinder in motion. It is so arranged that a quantity of combustible matter, equal to that which it consumes, falls constantly into it. A state of combustion is kept up by the air pump. Part of the air passing from this rushes into the furnace; the rest combines with the coal gas, forming thus a gaseous mixture, the volume of which is far greater than that of the air previous to its introduction to the furnace. This mixed air acts on the piston of the cylindre moteur with a force proportionate to the increased volume produced by the elevation of the temperature.

The American Exchange and Review, of Philadelphia, says: A "caution" has been put up in regard to what is styled the "Columbia Gold Mining Company of Colorado." "Beware" is written on the notice board. The company claims in its prospectus as its mines, "the celebrated Bobtail, Fiske and other well known lodes, including also a Tunnel Claim of 5,000 consecutive feet, or nearly a mile in length, directly on the Fiske Lode, commencing immediately opposite Black Hawk Point, at Black Hawk City, the whole property, embracing 8,700 feet, of which 1,900 are developed claims, and 1,800 feet opened, and 5,000 feet Tunnel claim, with a valuable quartz mill now running and in successful operation." A local mining journal, speaking from the knowledge derived from being on the spot, says: The Tunnel is believed to be on the extension of the Fiske, but it has only been pre-empted. So far as we can learn all the developed or opened claims on the above-mentioned lodes are owned by other individuals or organizations than the Columbia Gold Mining Company of Colorado.

WORKING THE SULPHUR DEPOSIT.—Dixon & Co., owners of the sulphur deposit at Humboldt City, California, have sent a load of three thousand three hundred pounds of it to Carson City. There is an immense body of the mineral, and the two owners of it will undoubtedly make their fortune. It is described as very pure.

IMPORTANT IMPROVEMENT IN PHOTOGRAHNG.

Mr. Jacob Shew, of this city, has discovered a new and most important improvevent in the photographic art, the advantages of which consist in the production of a softness, clearness and delicacy of tone in the pictures, unattainable by any process hitherto employed. It is applicable to any size of photograph, and can be employed with equal success in printing old negatives —as with those recently taken.

The discovery consists simply in the employment of ground glass, instead of plain glass, as the medium through which the light is made to pass in producing the transfer from the negative. It is well known that the advantage of the chromatic process of photographic printing is much greater with some kinds of negatives than with others. The prints from all faint negatives lacking intensity, will be much improved by this process and any photographer knowing the difficulty of at all times obtaining the proper degree of intensity, will at once appreciate the advantage of a printing process which corrects any such lack of perfection in their negatives. Again the spots often seen on photographic prints, caused by specks of dust lighting on the glass of the frame while printing, are avoided by the effects of the diffused light falling through the ground glass used in the new process.

But the greatest advantage of all is in the softness and mellowness of the tone of the prints, giving them something of the finish and appearance of finely retouched pictures without losing any of the detail or expression sometimes lost in reducing —*San Francisco Mining Press.*

NATURE PLAYING AT MUD PIES.—In 1828, Dr. Duncan observed in certain sandstones the footprints of tortoises, and following up the clue thus furnished to a suggestive mind, the Dumfrieshire discovery has expanded into a separate science called Ichnology. It amounts to this. Myriads of millions of years ago, the tide was out, and the beach was smooth and soft and flat, and there fell a shower of rain and pitted the surface in a particular way; part of it was hail, which made its own particular mark. Then came a little salt water lizard, or a crab, sliding along, or a frog, the size of a well-fed pig, leaping and waddling by turns; and on the micacious mud each inscribed the whole history of that day's proceedings—a little autobiography or Pilgrim's Progress in the genuine reptilian or batracian handwriting; and there it remained until the tide gently rose and with fine sand or clay filled up the impressions. And now that the whole is converted into rock, there comes some exploring Miller or Nantel, and turnes over the stony leaves and reads the record as plain as if it had been printed yesterday.—*Good Words.*

A KIND WORD FOR "MOTHER."—Despise not thy mother when she is old. Age may waste a mother's beauty, strength, limbs, senses, and estate; but her relation as mother is as the sun when it goes forth in its might, for it is always the meridian, and knoweth no evening. The person may be grey-headed, but her motherly relation is ever in the flourish. It may be autumn, yea, winter with a woman, but with the mother, as mother, it is always spring. Alas, how little do we appreciate a mother's tenderness while living! How heedless we are in all her anxieties and kindness! But when she is dead and gone, when the cares and coldness of the world come withering to our hearts, when we experience how hard it is to find true sympathy—how few will befriend us in misfortune— then it is that we think of the mother we have lost.

GEOLOGY OF GREAT BRITAIN.—In a report made to the British government by Murchison, the geologist, it appears that Great Britain yields yearly nearly eight million tons of iron ore; and the coal product amounts annually to about eighty-three and a half million tons, the estimated value ranging from eighteen to twenty-one millions sterling.

PETROLEUM REVIEW—SEPTEMBER 15TH.

NEW YORK, Sept. 15, 1864.

Crude. The market since my last has been dull, and drooping and closes heavy. I notice the following sales for the past few days—2000 bbls S. O. all this month, at 47 cts.

2,500 Bbls B O. all this month at 47½—500 Bbls 40° to 47° gravity on the spot, at 45 cts—and 350 Bbls 40° to 45° gravity at 46 cts. A telegram just received from Oil Creek, quotes Oil in Oil City at $8 per Bbl.

Refined in bond has been in fair request, and closes firm. I notice the following sales among the latest made—350 bbls prime white 76 cts—500 bbls light straw to white 74 cts 250 bbls prime light straw to white at 75½ cts F. O. B.

Free Oil has been very dull and closes 80 to 85 cts job lots bringing somewhat better prices. Oil in cans for Export may be quoted for Bonded $1.00 per gall—and Free $1.10 per gall.

Benzole. dull.

Remarks. In consequence of the decline in Gold—Oil has fallen off in price—in one day dropping ten cts per gall. But as Gold has become more steady and as we are in receipt of better quotations from the European Market, Oil closes firm. It is to be hoped that holders of stock in Oil Companies will not flatter themselves that the fall in Crude—was owing to any expected increase of production. The arrivals for the past two weeks are 29.402 bbls. The Export during the same time is 1.835.075 galls and since Jany. 1st. 14.-977.713 galls.

B. L. HARSELL,
Commission Merchant,
132 & 134 Maiden Lane, N. Y.

While the internal revenue law was under consideration in Congress, there was a proposition made to tax the gross yield of mines 5 per cent. Much angry comment was thereby provoked in the Pacific region, and with persons residing east having interests there. The most rampant objectors, however, did not oppose a moderate duty on the net proceeds. Congress appears to have yielded to the wishes of the Pacific miners, and the tax takes shape as an ad valorem duty of 1½ per cent. on gold and silver bullion, in lump, ingot, bar or otherwise. Quicksilver produced from the ore 2 per cent.

The ad valorem duty on other metals at the first stage of production, is as follows: Copper, ingots, pigs or bars, 3 per cent.; Lead 3 per cent.; Pig iron $2 per ton; Blooms $3 per ton; Spelter 3 per cent.; Oxide of Zinc 35 cents per 100 pounds.

LAKE SUPERIOR COPPER.—We take the following from the U. S. Railroad and Mining Register.

The systematic measures in operation to stock the copper mines of Lake Superior with trained and skilled European miners, seem to promise entire success. Every intelligent miner imported into the Lake Superior region is sure to write back to his kindred and friends such accounts of high wages and such descriptions of lodes rich in virgin copper, as cannot fail to swell the number of emigrants, and thereby rapidly increase the product of the region. The markets of the world are open to Lake Superior copper, which now commands more than a thousand dollars per ton.

WATER SUPPLY OF NAPLES.—The authorities at Naples are about to introduce a new supply of water for the use of that city. Mr. Bateman has reported on the project, which is to cost 750,000l. The water is to be conducted a distance of 47 miles, and the quantity to be served per head of the population is 20 gallons per day. The present supply is about 8 gallons per day.

NEW YORK MINING EXCHANGE.

NEW YORK, Sept. 15th, 1864.

	Bid.	Asked		Bid.	Asked
Copper Stocks.			***Gold Stocks.***		
Aztec	7⅛	9	Benton	1	1⅛
Bedford	1	1⅛	Consol'd Gregory	25	28⅜
Boston	4⅛	5⅜	Corydon	—	3
Caledonia, A. P.	10	12	Gunnel	3⅜	4⅜
Canada	3⅛	4	Great Western	—	8
Carp Lake	3	5	Hope	—	9
Central	65	70	Isaac's Harbor	⅜	⅞
Columbian	—	24	Manhattan	—	9
Copper Falls	34⅛	38	Mariposa	44	44⅜
Clifton	—	$1	Montana	⅜	1
Dacotah	—	5⅛	New York	2⅜	3
Derby	⅞	1⅜	N. Y. & Nova Scotia	⅝	1⅛
Douglass	—	—	Quartz Hill	9¾	10
Evergreen	18⅜	20	Quicksilver M'g Co	81	82
Flint Steel River	12	13⅛	Rocky Mountain	—	10⅜
Frue	2⅜	5	Smith & Parmelee	7	12
Grand Portage	—	—			
Hancock	12⅜	14	***Coal Stocks.***		
Hamilton	—	6	American	98	100
Hilton	5	6	Ashburton	—	25
Hudson	1	2	Central	62	65
Huron	32	33	Cumberland	61	62
Indiana	8⅜	9⅜	Del. & Hud. Canal	206	208
Isle Royale	20	20⅜	*Hampshire & Balt.	104	110
Keweenaw	—	6	Pennsylvania	213	215
Knowlton	7	10			
Lafayette	1	2	***Lead Stocks.***		
Manhattan	—	—	Bucks County	⅝	⅞
Mendota	—	—	Clute	1⅜	1⅞
Merrimac	4⅜	5⅛	Erie	—	20
Minnesota	33	37	Macomb	3⅛	5
New York, A. P.	2	3⅛	Plancentia Bay	1⅜	1⅝
N. J. Consolidated	4	4⅜	Sussex	⅜	⅞
Norwich	—	6	Wallkill	3⅛	6
Ogima	5	6¼			
Ontonagon	3	4⅛	***Iron Stocks.***		
Penn	—	11⅜	Copake	8	10
Providence	1⅜	2	French Creek	⅜	1
Quincy	96⅜	98	Teal Lake	4⅛	6
Reliance	1⅛	2⅛			
Rockland	12⅜	14	***Miscellaneous.***		
Superior	8⅜	9	Rutland Marble	17	20
Sharon Consolidated	—	3	* *Ex. div.*		

TO ADVERTISERS.—Our paper offers a superior medium as an advertising agent, to all those who manufacture or sell machinery or appliances of any kind for Gas, Mining, Water, Sewerage, the production or purification of Oils, &c. &c., not so much on account of a wide-spread circulation, as from the fact that it goes directly to the hands of those who are constantly using and requiring machines and improvements for these branches, and who look through our columns for information where to procure them. The class of people who read our paper not only peruse our pages of reading matter, but read the advertisements as well, for the reason that they are directly interested in all things pertaining to their business. We therefore ask, with confidence that we can do them justice, all parties having machinery or improvements of any kind for either of the objects to which our paper is devoted, to send in their advertisements and avail themselves of these advantages. It will be observed that our terms for advertisers are very reasonable.

THE STRONGEST BANK IN THE WORLD.—The Bank of Genoa, which has been in existence hundreds of years, has, perhaps, proved itself the strongest institution of the kind in the world It is a remarkable fact in its history that its administration has always been as permanent and unchangeable as that of the republic has been agitated and fluctuating. No alteration ever took place in the mode of governing and regulating the affairs of the bank; and two sovereign and independent powers, at war with each other, have been within the walls of the city, without producing the slightest shock to the bank, or causing it to secrete any of its books or treasures.

Admit no guest into your soul that the faithful watch-dog in your bosom barks at.

Fine connections are apt to plunge you into a sea of extravagance, and then not to throw you a rope to save you from drowning.

He who puts a bad construction upon a good act reveals his own wickedness at heart.

ROBBINS' PATENT
GAS AND WATER JOINT.

THE PROPRIETORS of this unrivalled joint are now prepared to introduce it to general use, and to guarantee that, in all respects, it will fulfil perfectly all the requirements of either water, gas, or steam. It is a joint which remains in all situations absolutely tight.

The following illustrations, with the appended explanations, will give a good idea of the improvement:

Fig. 3.

Fig. 1.

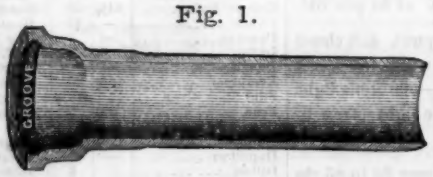


Fig. 2.

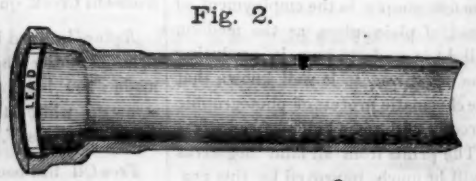


Fig. 4.

FIG. 1. Is a sectional view of a pipe showing a groove to receive a lead ring.

FIG. 2. Is a sectional view of a pipe showing a lead ring in the groove.

FIG. 3. Represents a former, which is used in the bell end of the pipe while casting the lead ring. Before using the former, however, a strip or belt of India rubber is first inserted in the socket, against which the former rests to prevent the lead escaping from the groove while being cast. Upon the cooling of the lead, the former and rubber ring are withdrawn from the socket, and the lead ring is left projecting inwards from the groove all around, forming an indestructible packing to receive the spigot-end of the pipe.

FIG. 4. Shows two pieces of pipe in connection with an hydraulic jack, by which the spigot-end of the pipe (which is cast tapering and may be cast in a chill), is forced into the lead ring in the groove which perfects the joint. A, represents the jack; B, B, the chains by which the pipes are drawn together; and C, C, pieces of pipe.

This ring joint packing may be cast at the foundry or any convenient place, and when delivered at the ditch, may be laid, and perfect joints formed, by any laborer, above or below the surface, or in ditches filled with water, there being *no joint ditching required*, and it can be laid with very great rapidity.

Among the economies realized by this joint may be enumerated, the saving in the weight of the pipe, in the amount of lead required to be used in forming the packing, in the labor of ditching, and in laying the pipe.

The bell or socket may be cast one-half the usual length, as the width of the groove requires, but from a half to one and a half inches, according to the size of the pipe, thus saving in the total weight about two hundred pounds per ton.

The weight of lead required to form this joint, as compared with the amount of lead used in forming a joint according to the old method, is fully seventy-five per cent. less, only so much being required as to maintain the compensating principle, or enough to allow (upon the raising or depressing of the line of pipe out of a direct line) what is lost upon one side of the ring packing, to take its place upon the other; thus securing flexibility of the joint without affecting its reliability. The use of yarn or hemp packing is dispensed with, the cost of which is an entire saving as compared with the old method of making joints.

The saving of labor in ditching is the total amount usually expended in digging joint-holes, there being *no joints to be caulked.*

The saving in labor in laying pipe furnished with this joint is a sum equal to the whole cost of carrying lead, fuel, ladles to the ditches, casting the lead, bailing out water, and the entire labor of caulking, less only the sum charged for casting the lead ring packing at the foundry, which is comparatively trifling. This last-mentioned economy has been estimated by the best engineers at seventy-five per cent., or the same as the saving in the quantity of lead used.

The cost of pipe cast from our patterns is the same per ton as pipe cast for the old form of joint. The principal iron-founders propose to charge the same price.

We have submitted these joints in water-pipes to a pressure of two hundred and fifty pounds to the square inch, and they have remained perfectly tight. It has also been submitted for months in gas-pipes to the ordinary pressure of our city gas-mains, without any leakage whatever. We are aware that these statements may be deemed by many extravagant, but the merits of the improvement warrant them all, and the most skeptical may be fully convinced by an investigation of its value, and by witnessing the tests to which we submit it, or by its use under any conceivable circumstances.

TESTIMONIALS.

OFFICE OF THE WATER COMMISSIONERS,
CITY HALL, JERSEY CITY, October 14th, 1863.

Dear Sir,—On the 26th of May last, about two hundred and sixty feet of cast-iron water-pipes, six inches in diameter, with joints constructed according to your invention, were laid for the Jersey City Water-Works, in Prospect street.

The operation of uniting the joints of the pipes, was performed with remarkable facility, and with an important saving in time, materials, and labor. The joints proved perfectly water-tight, after turning the full head of water on the pipes.

In my opinion, your invention has proved entirely successful, and will be found highly beneficial to water companies.

Yours, respectfully,
ROBT. C. BACOT,
Superintendent and Engineer, Jersey City Water-Works.

MR. R. C. ROBBINS.

ENGINEER'S OFFICE, CROTON AQUEDUCT DEPARTMENT.

Dear Sir,—I have examined your plan for making joints in cast-iron water pipes, and have a report from one of my assistants, of certain experiments made by you, to prove the certainty and economy with which the joints can be made, and their stability when finished.

I think the experiments showed that the joints could be made quite as rapidly, if not more rapidly, than those made in the ordinary method now in use; the quantity of lead used was less than that required in the common joint, and no yarn packing was required. In these respects, your joint seems superior.

After the joints were made, a pressure of three hundred pounds to the square inch, was put upon the pipe in such a manner as to test the efficiency of the joint to prevent both leakage of water, and separation of the pipes from each other longitudinally. This pressure failed to produce either leakage at the joint, or separation, so long as the pipes lay in a direct line; but on deflecting them six and a half inches, in a length of twelve feet, the joint commenced leaking. It is fair to add, that this is a greater deflection than would often be found necessary in laying pipe.

I think the efficiency of the joint in both the points tested in this last experiment, might be increased by increasing the quantity of lead, both in thickness and width.

Altogether, the result of the experiments was such that I have determined to make a more thorough test of your invention by putting down about one thousand feet of pipe, when we commence our operations for the coming season.

The diameter of the pipe subjected to experiment, was six inches, and is the same size that I propose to put down next year.

I am, very respectfully, your obedient servant,
A. W. CRAVEN, Chief Engineer, &c.

To R. C. ROBBINS, Esq., Jersey City.

METROPOLITAN GAS-WORKS,
ENGINEER'S OFFICE, NAW YORK, October 9th, 1863.

Dear Sir,—The undersigned had the pleasure of being present at an experimental test of your patent joint for gas and water pipe, made at the yard of the Croton Aqueduct Department, and cheerfully testify to the results obtained, namely:

First experiment was made with two lengths of eight-inch pipe, jointed together, when a pressure of three hundred pounds to the square inch was applied. This pressure did not force the pipe apart, nor start the joints, but they remained, during this experiment, perfectly tight.

Second experiment was made by deflecting the pipe five inches, which is about equal to eighteen inches in one hundred feet, and the same pressure applied, which caused a small leak at the joints.

Third experiment was made by taking the pipes apar and rejointing them, when the same pressure was applied when lying straight and when deflected; at this experiment there was no leakage.

From these severe tests it is my impression that the superiority of your patent joint has been made manifest, and that it must eventually supersede the old way of jointing pipes together, saving both time and material.

Wishing you success in your enterprise,
I am, very respectfully, yours, &c.,
AMBROSE J. WHITE, Engineer.

To R. C. ROBBINS, Esq.

OFFICE OF THE METROPOLITAN GAS-LIGHT COMPANY,
NEW YORK, October 9th, 1863.

Dear Sir,—Having been present at the testing of your patent joint for gas and water pipe, at the yard of the Croton Aqueduct Department, I can testify to the results as stated by Col. A. J. White and fully concur with him in the opinion expressed in his letter to you of this date.

Very respectfully, yours,
W. TITUS, Secretary.

R. C. ROBBINS, Esq.

NEW YORK, October 23d, 1863.

Gentlemen.—I am pleased to be able to inform you, that we are fully satisfied that we have done well in adopting your "Improved Joint." in the construction of an aqueduct which we are now building on Oil Creek, Northwestern Pennsylvania.

We have ten miles of three and four inch pipe to lay this season, and, in our estimation, the perfection of the joint, economy in lead, and rapidity with which the pipe can be laid, render it entirely preferable to any other method of laying pipe.

Our Mr. Hutchings advises us that he is putting down the three and four inch pipe at the rate of twenty-five to thirty lengths per hour, with two men in the trench. We are much pleased with this result.

Respectfully yours,
HUTCHINGS & FOSTER.

MESSRS. R. C. ROBBINS & Co.

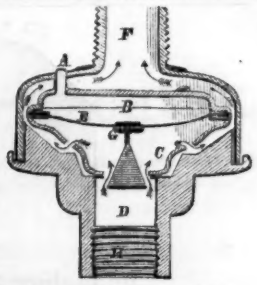
For further information, or for prices and terms, which will be very reasonable, apply to

R. C. ROBBINS & CO.,
No. 218 FULTON STREET NEW YORK

THOMPSON'S

PATENT

AUTOMATIC GAS CONTROLLER.



Notice to Gas Companies and Consumers of Gas generally.

WE RESPECTFULLY INVITE YOUR ATTENTION TO THE FOLLOWING TRUTHFUL DESCRIPTION OF THE construction and operation of this recent and most important invention; its application to every street lamp, and on the fixtures within the works of the Gas Companies, as well as for the use of the general consumer, will be found to effect perfectly and reliably, the object so long sought for, viz.: **a perfect control of the Gas under varying pressures, emitting the Gas at the burner without force, and without increase or diminution of quantity, and hence promoting the highest possible illuminating power of the Gas.**

THE AUTOMATIC GAS CONTROLLER

Is designed to occupy the place of the gas-burner. Within the circumference of a small cylinder, below the burner, is placed a conical valve, attached to a movable diaphragm, the valve and valve seat is proportioned, so that under a supply of Gas, varying in pressure from four-tenths to five inches, the burner will continue to produce the same consumption and development. The unerring accuracy of movement of the Diaphragm at every change of pressure, whether gradual or sudden, and its positive control of the valve which admits, by its proportionate increased or diminished aperture, the same unvarying amount of Gas, has elicited the unqualified approbation of engineers and other experts in the profession.

The simplicity of its construction, and materials used, are a sure guarantee of its durability and continued successful operation. They afford to the consumer of Gas the advantage of a **superior light, with the greatest possible economy**; and for the Gas Company, they control o the Street Lamps, affording a more satisfactory light for the public, without waste.

The public are invited to witness its operation, at the Office of the Company; and samples will be sent to Gas Companies for experiment, on applicatiou by etter or otherwise.

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Office, 52 GREENE ST., (up stairs.)

A. L. BOGART, AGENT, 592 BROADWAY,

New York.

We are permitted to refer to the following Gentlemen, who have thoroughly examined our Gas Controller:

GEO. H. KITCHEN, Inspector of Gas Meters, 561 Broadway.
CHAS. ROOME, President Manhattan Gas Company.
J. H. ADAM, President New York Gas Company.
PETER COOPER, Cooper Institute.
JOHN A. DUFF, Olympic Theatre.

THE AMERICAN METER CO.,

Organized under the General Manufacturing Laws of the State of New York.

SAMUEL DOWN, PRESIDENT. HENRY CARTWRIGHT, VICE PRESIDENT. RICHARD MERRIFIELD, SECRETARY AND TREASURER.

TRUSTEES.

SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
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This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS & REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

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1 BARRETT STREET, BOSTON, will meet with prompt attention.

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Patent GATES, for Water and Steam-stops.
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GAS APPARATUS
For Country Residences, Public Buildings, &c.,
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EVERY DESCRIPTION OF GAS FIXTURES.
Gas Fitting in all its branches.
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NEW YORK FIRE-BRICK and Clay Retort Works. (Branch Works at Kreischerville, Staten Island.)

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Manufacturer of all kinds of FIRE-BRICK, GAS-HOUSE TILES, to suit all the different plans in use. Clay Retorts and Dentists' Muffles. Orders filled at short notice.

GLYCERIN
FOR
Filling Wet Gas-Meters,
Cheaper than Whisky or any other substance.

We have furnished the Cincinnati Gas and oke Company 300 barrels Glycerin, for filling their wet meters, and are now ready to supply other Gas Companies at the lowest cash prices.

We warrant our Glycerin not to corrode the meter metal, nor to freeze at the lowest ordinary temperature, nor to evaporate.

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To Gas Companies.

A YOUNG MAN, FROM ENGLAND, thoroughly educated, and who has had nine years experience in the Newcastle-under Lyne Gas-Works, England, as an assistant Manager, desires a similar situation in some Gas-Works in the United States. He has credentials of capacity for such a position.
Address, M. C. P. LAWTON,
Office GAS-LIGHT JOURNAL,

WOODEN PURIFYING TRAYS.

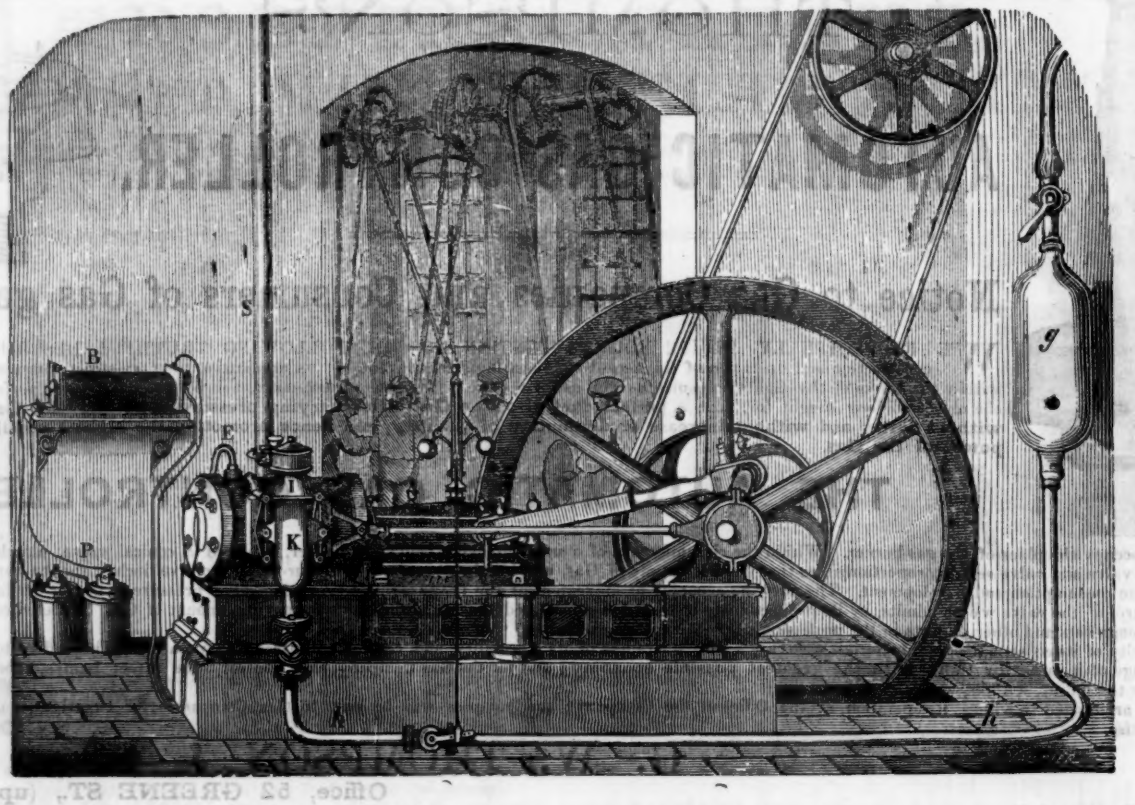
PATENT
Conically Slotted Solid Wood Sieves
FOR GAS PURIFIERS.
CAUTION
TO
GAS MANUFACTURERS.

The Conically Slotted Solid Wood Tray was patented 31st October, 1862, by N. O. Hawxhurst, assignee of Wm. Combe, and all persons are cautioned against purchasing such trays of R. G. Hunt, or any other person except the subscriber, as it is a direct infringment of said patent. The following companies are now using these trays.

Manhattan, New York,
Williamsburgh,
Brooklyn,
Albany,
Baltimore,
Philadelphia,
Chicago,
Louisville,
And numerous others

Orders received by mail or otherwise.

JOHN L. CHEESMAN,
147 Ave. C, New York City.



MOTEUR—LENOIR.

LENOIR GAS ENGINE.

This is a horizontal engine, in which a piston, by a connecting rod drives a horizontal shaft.

The gas enters by the pipe "h" from the regulating reservoir "g," (made of vulcanized india rubber,) which regulates the feeding and the branches connected with the gas-pipe.

The tube, K, receives the gas conveyed by the pipe "h," and conducts it to the valve, which opens and closes alternately, by means of a rod moved by an eccentric wheel fastened to the end of the shaft.

Two of Bunsen's piles, P, sufficient to produce the electricity are placed at a little distance from, and in communication with a Ruhmkorff electric apparatus, B. The electric current of this apparatus is conducted by means of insulated wires to the electricity distributor "m," placed on the front of the frame, while the current of electricity and its arrival at the inflammator, inserted at each end of the cylinder, is directed by the movement of the piston-rod, which, by an ingenious combination, impels a small movable slide before the distributor.

The burnt gas, after having performed its functions in the machine, escapes, by means of a valve, through a pipe, S, and the water designed to cool the interior of the cylinder enters through a double passage, by means of a pipe situated near the escape-valve, and goes out by the pipe, E.

A two horse and a half horse Engine are now in practical operation at the brass cock manufactory of Mr. A. Carr, *No.* 135 *Mercer St, between Prince and Houston Streets,* New York where those interested are invited to call and examine them.

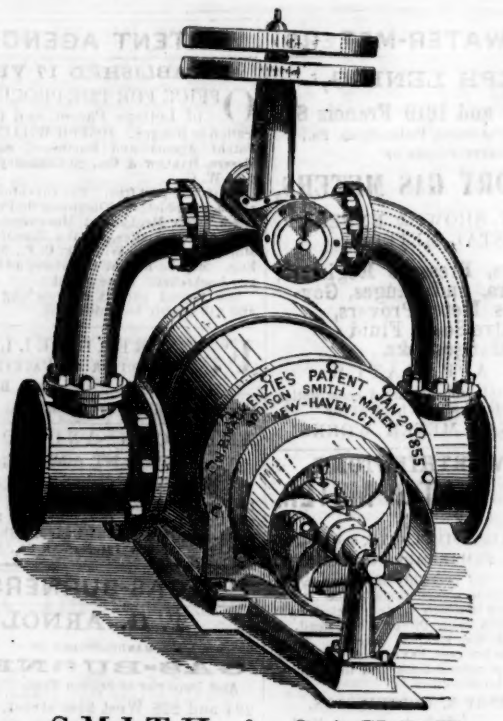
THE LENOIR GAS ENGINE

Requires no Fire and makes no Smoke,

No Noise, no Dirt, and is thoroughly safe.

It is propelled by the expansion of Air, dilated by the combustion of Gas within the cylinder, ignited by the

ELECTRIC SPARK.



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Sole Proprietors and Manufacturers of

THE MACKENZIE PATENT GAS EXHAUSTER

AND

PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. uel. Address SMITH & SAYRE, 458 Broadway, New York.

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WET AND DRY GAS METERS (Consumers'),
STATION, EXPERIMENTAL AND SHOW METERS,
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All our work warranted. All orders addressed to
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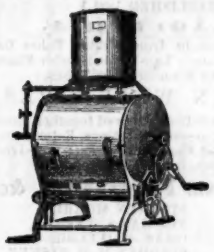
DRAKE'S

PATENT

AUTOMATIC GAS MACHINE.



THIS MACHINE, which has been in constant use for more than two years, is now acknowledged to be the

Most Convenient, Simple, and Efficient Method

OF LIGHTING BUILDINGS OF ALL KINDS, out of the reach of regular gas-works, ever brought to public notice.

The SIMPLICITY OF THE APPARATUS, its ENTIRE FREEDOM FROM DANGER, the LITTLE ATTENTION REQUIRED, the EASE WITH WHICH IT IS MANAGED, and THE CHEAPNESS and SUPERIORITY OF THE LIGHT, has gained for it the favorable opinion of those acquainted with its merits.

The Machine takes up but little room; no disagreeable odor is experienced in its use; no fire is applied to the apparatus at all; it can be attached to ordinary gas-pipes used for coal-gas, and is burned through the same kind of fixtures.

These Machines are manufactured in Boston, by the AUTOMATIC GAS-MACHINE CO., and are for sale at their Store, 78 Washington street, Boston, and also at the Agency, MITCHELL, VANCE & CO.'s, No. 620 Broadway, New York

For further particulars, address—

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PRINCE'S METALLIC PINT,

AN INDESTRUCTIBLE COATING FOR

IRON, TIN, and WOOD.

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. I prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

Terms, by the Barrel or Half Barrel, Four Cents per Pound.

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

Also, Prince's Imperial Black Paint, and Prince's Protoxide of Iron.

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CASH CAPITAL, - - - $400,000.
Assets, June 1, 1864, - - - 600,000.

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Scrip Dividend, 1862, - - 60 per Cent.
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The Policies entitled to participate receive 75 per cent. of net Profits.

Insures Buildings, Merchandise, Furniture, Rents, Leases, against loss or damage by FIRE, and MARINE RISKS on LAKES, RIVERS and CANALS.

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HENRY WESTON, Vice Prest.
WM. K. LOTHROP, Secretary.
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It brings out the grain of the wood in all its original beauty, and immediately after being applied, the article polished is perfectly dry, thus possessing a very great advantage over varnish or any kind of liquid polish.

It will keep in any climate, and is always ready for use.

ONE BOX IS SUFFICIENT TO RESTORE AN ENTIRE HOUSE OF FURNITURE.

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BY ROYAL LETTERS PATENT.

HERT'S & CO'S
AMALGAMATED
ALUMINUM, ZINC AND PLATINA
PENS.
WARRANTED ANTI-CORROSIVE.

In introducing this invention, Messrs. HERTS & Co. beg to call attention to the following advantages combined in these Pens:

They possess the Anti-corrosive properties of the Gold Pen.

The Freedom of the Quill, and

The Flexibility of the Steel Pen.

Thus *combining* in *themselves* every advantage found in other pens; and by their anti-corrosive properties entirely obviating all the objections hitherto existing against the use of Metallic Pens.

Another advantage peculiar to these Pens, is that they *improve* after being a *short time in use*, and may be left in the ink without fear of injury, as they *never need wiping.*

THE No. 808 "medium points," are adapted for *office use* and *general business purposes.*

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The undersigned have given HERTS & Co's Pens a trial, and are satisfied to recommend them to the general public.

FOWLER & WELLS.

Manufactory, Bradford Works, Birmingham,
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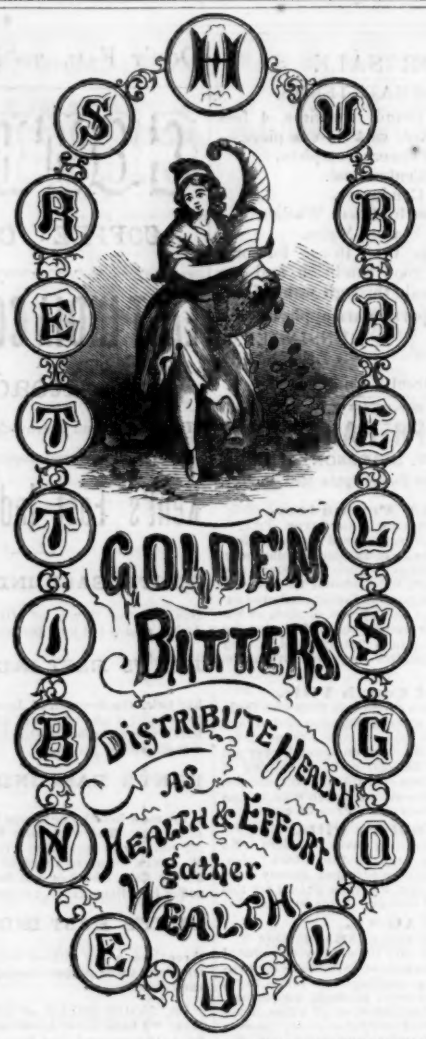
Orders for the United States, Canada, South America, and the West Indies, must be addressed to

H. B. HERTS, 52 John St., New York,
SOLE CONSIGNEE.

from whom samples may be obtained *gratis*, on application by mail or personally.

The Am. Advg. Agency, 389 Broadway, N. Y., will receive orders for the above-named Pens.



New York, April 18th, 1864.

* * * * * *

We respectfully invite your attention to and consideration of the justly celebrated and reliable remedy for DYSPEPSIA, HEARTBURN, DEBILITY and PROSTRATION. The Proprietors are proud to acknowledge the unparalleled success which has attended the sale of their valuable preparation, known in nearly every portion of the civilized world as the

"GOLDEN BITTERS."

We risk nothing when we term them a *valuable preparation*, for they are one of the few articles of the present day which are not a humbug; and we are willing and able to satisfy any person or persons who will call upon us, that the celebrated "GOLDEN BITTERS" are a genuine *bona-fide hygienic* article. It is the wish of the proprietors that the virtue of the article be tested before condemning. A decision of their merits by any one who has tried them, is worth a million of purchased bogus testimonials.

For Creating a Healthy Appetite

they are invaluable, and are unequalled as a TONIC. They are mild in their action, and operate by giving *vigor* and *strength* to the system,—not by any change they produce in the solids, but through the medium of the living principle.

They are Purely Vegetable,

being composed of Gentian Root, Calamus, Sassafras, and many other remedial agents of the Vegetable world, all preserved in Jamaica Rum and Sherry Wine.

As a Beverage,

They are the most *wholesome, invigorating* and *palatable* stimulant ever offered to the public And the fact of their being prepared chemically and scientifically, precludes the possibility of a bitter, unpleasant taste, common to Bitters generally offered for sale. We especially recommend them to LADIES, and particularly to those suffering from

DEBILITY, WEAKNESS, AND PROSTRATION.

Half a wine glass of these "Bitters" three or four times a day, will produce a remarkable healthy change in persons greatly debilitated.

The "Golden Bitters" have been tried and not found wanting. They are put up in our own *Patent* quart bottles, and for sale by Druggists, Grocers, &c., throughout the world. Each bottle bears a fac-simile of the signature of Hubbel & Co.

GEO. C. HUBBEL & Co, Sole Proprietors.
CENTRAL DEPOT, American Exp. Building, New York.

THE GOLDEN BITTERS.—We are not an advocate of stimulants of an alcoholic character; indeed we deprecate this "daily tonic" idea—this "morning toddy" which we see offered in all sorts of shapes as a recuperator, invigorator, revitalizer, &c. As a rule all artificial stimulants are dangerous remedies, and must be taken into the system as you would mercury or arsenic, in very small doses. But we have had an opportunity to try the now well-advertised article known as Hubbel's Golden Bitters, and are frank to say that where the system needs building up, where a stimulant is required to aid nature in restoring a lost appetite and infusing a vigorous action to the debilitated functions, we can recommend these Bitters. Hubbel's Golden Bitters are evidently intended to improve the debilitated human system, rather than to tickle the palate, and are, therefore a harmless and safe remedy o keep in the house.—*New York Weekly Day Book.*

YONKERS, May 9th, 1864.

MESSRS. GEO. C. HUBBEL & Co.:

GENTS,—Having used only two bottles of your "Golden Bitters," I can recommend them with the utmost confidence as a Tonic, and particularly for a change of diet and water. It is as well for ladies and children, giving them part of a wine glass two or three times a day.

Yours respectfully,
GEORGE C. BARKER.

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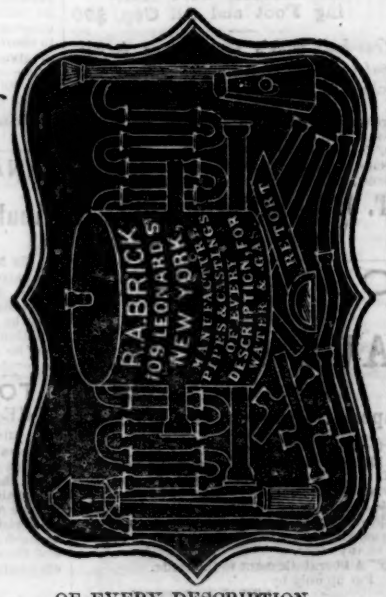

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